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FURUNO

INSTALLATION MANUAL

MARINE RADAR

MODEL FR-2135S

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NISHINOMIYA, JAPAN

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SAFETY INSTRUCTIONS

WARNING

Radio Frequency Radiation Hazard

The radar scanner emits electromagnetic radio frequency (RF) energy which can be harmful, particularly to your eyes. Never look directly into the scanner aperture from a close distance while the radar is in operation or expose yourself to the transmitting scanner at a close distance.

Distances at which RF radiation levels of 100 and 10 W/m^2 exist are given in the table below.

Note: If the scanner unit is installed at a close distance in front of the wheelhouse, your administration may require halt of transmission within a certain sector of scanner revolution. This is possible—Ask your FURUNO representative or dealer to provide this feature.

Model	Radiator type	Distance to 100 W/m^2 point	Distance to 10 W/m^2 point
FR-2135S	SN30AF	—	0.7m
	SN36AF	—	0.5m

WARNING



ELECTRICAL SHOCK HAZARD

Do not open the equipment unless totally familiar with electrical circuits and service manual.

Only qualified personnel should work inside the equipment.



Wear a safety belt and hard hat when working on the scanner unit.

Serious injury or death can result if someone falls from the radar scanner mast.

Construct a suitable service platform from which to install the scanner unit.

Serious injury or death can result if someone falls from the radar scanner mast.

Turn off the power at the mains switchboard before beginning the installation.

Fire, electrical shock or serious injury can result if the power is left on or is applied while the equipment is being installed.

Do not install the display unit where it may get wet from rain or water splash.

Water in the display unit can result in fire, electrical shock or equipment damage.

⚠ WARNING

Be sure that the power supply is compatible with the voltage rating of the equipment.

Connection of an incorrect power supply can cause fire or equipment damage. The voltage rating of the equipment appears on the label above the power connector.

Use only the specified power cable.

Fire or equipment damage can result if a different cable is used.

⚠ CAUTION

Ground the equipment to prevent electrical shock and mutual interference.

Observe the following compass safe distances to prevent deviation of a magnetic compass:

	Standard compass	Steering compass
Display Unit	1.70 m	0.90 m
Scanner Unit	5.00 m	2.80 m
Power supply unit PSU-004	0.50 m	0.30 m

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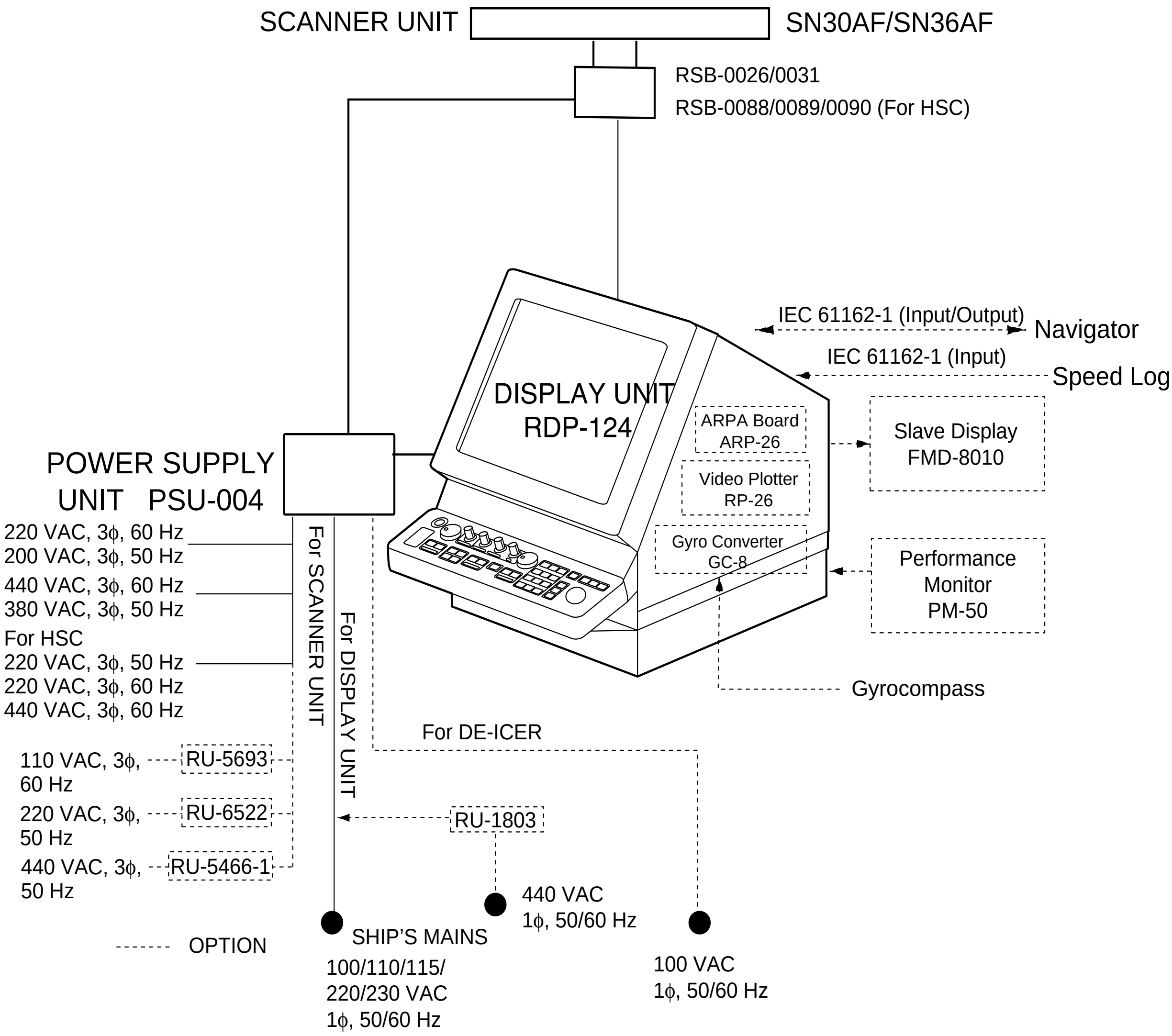
Standard Supply

<table>
<tr><th>Name</th><th>Type</th><th>Code No.</th><th>Qty</th><th colspan="2">Remarks</th></tr>
<tr><td rowspan="7">Scanner Unit</td><td>SN30AF</td><td>-</td><td rowspan="2">1</td><td colspan="2" rowspan="2">Radiator</td></tr>
<tr><td>SN36AF</td><td>-</td></tr>
<tr><td>RSB-0026</td><td>-</td><td rowspan="2">1</td><td colspan="2" rowspan="2">Antenna chassis, with or without deicer</td></tr>
<tr><td>RSB-0031</td><td>-</td></tr>
<tr><td>RSB-0088</td><td>-</td><td></td><td colspan="2" rowspan="3">Antenna chassis for HSC</td></tr>
<tr><td>RSB-0089</td><td>-</td><td></td></tr>
<tr><td>RSB-0090</td><td>-</td><td></td></tr>
<tr><td>Display Unit</td><td>RDP-124</td><td>-</td><td>1</td><td colspan="2"></td></tr>
<tr><td rowspan="4">Power Supply Unit</td><td>PSU-004-70-23-S</td><td>-</td><td rowspan="4">1</td><td colspan="2">3ϕ, 220/230 VAC</td></tr>
<tr><td>PSU-004-80-10-S</td><td>-</td><td colspan="2">3ϕ, 380/440 VAC</td></tr>
<tr><td>PSU-004-70-23-HK</td><td>-</td><td colspan="2">3ϕ, 220/230 VAC</td></tr>
<tr><td>PSU-004-80-23-HK</td><td>-</td><td colspan="2">3ϕ, 380/440 VAC</td></tr>
<tr><td>Spare Parts</td><td>SP03-13100</td><td>000-087-698</td><td>1</td><td colspan="2">SP03-12506 (Display Unit),
SP03-10320 (Power Supply Unit)</td></tr>
<tr><td rowspan="4">Installation Materials</td><td>CP03-20000</td><td>000-087-699</td><td rowspan="4">1</td><td>CP03-14603, CP03-19105,
CP03-13907 Signal cable
S03-74-15 (15 m)</td><td rowspan="6">SEE PACKING LISTS</td></tr>
<tr><td>CP03-20010</td><td>000-087-700</td><td>CP03-14603, CP03-19105,
CP03-13907 Signal cable
S03-74-20 (20 m)</td></tr>
<tr><td>CP03-20020</td><td>000-087-701</td><td>CP03-14603, CP03-19105,
CP03-13907 Signal cable
S03-74-30 (30 m)</td></tr>
<tr><td>CP03-20030</td><td>000-087-702</td><td>CP03-14603, CP03-19105,
CP03-13907 Signal cable
S03-74-60 (60 m)</td></tr>
<tr><td rowspan="2">Accessories</td><td>FP03-06610</td><td>000-087-704</td><td rowspan="2">1</td><td>FP03-06201, FP03-06502,
FP03-06503, FP03-02710
Dust cover</td></tr>
<tr><td>FP03-06630</td><td>000-087-714</td><td>For console type:
FP03-06201, FP03-06504,
FP03-06502, FP03-06503,
FP03-02710
Dust cover</td></tr>
</table>

Optional Equipment

Name	Type	Code No.	Qty	Remarks
Remote Display	FMD-8010	–	1	
Gyro Converter	GC-8-2	008-446-520	1 set	Separate order
Interswitch	RJ-7	–	1	
Interswitch	RJ-8	–	1	
Performance Monitor	PM-50	–	1	Mandatory for IMO radar
Transformer Unit	RU-5693	000-030-456	1	110 V → 220 V, 3ϕ for scanner unit
	RU-1803	000-030-497	1	440 V → 100 V, 1ϕ for display unit
	RU-6522	000-030-410	1	220 V → 200 V, 3ϕ for scanner unit
	RU-3305	000-030-448	1	For deicer
	RU-5466-1	000-030-453	1	440 V → 200 V, 3ϕ for scanner unit
PM Installation Kit	OP03-150	008-485-490	1 set	
ARPA	ARP-26	008-485-500	1 set	
Video Plotter	RP-26-T	008-485-510	1 set	Tabletop, console type
	RP-26-Z	008-485-520		For separate control head
Separate Control Head Mounting Kit	OP03-151	008-485-530	1	
Alarm Kit	OP03-156	008-500-650	1	
Interface Unit	IF-2300	–	1	Mandatory for IMO radar

SYSTEM CONFIGURATION



MOUNTING

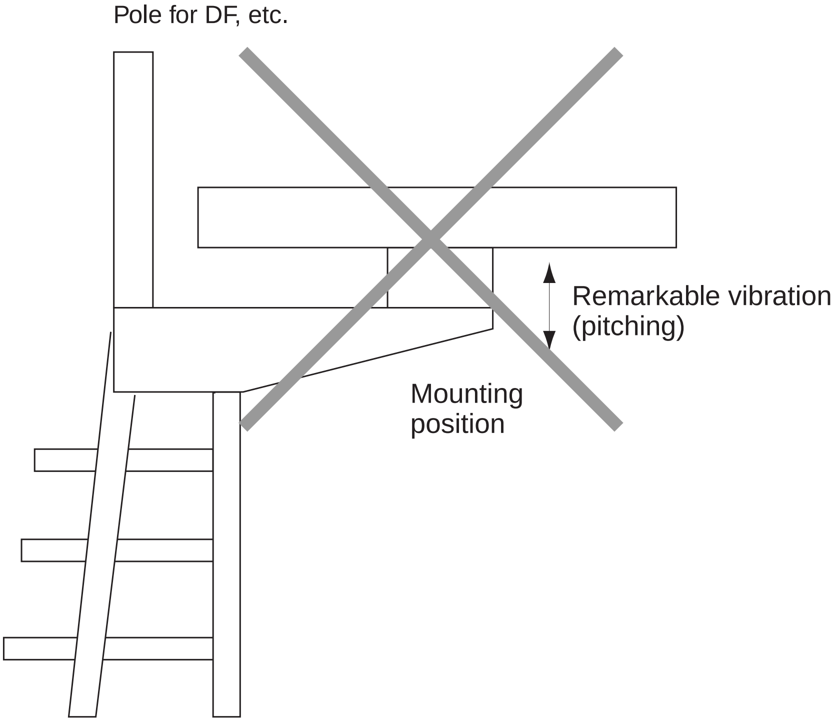
1.1 Scanner Unit

Mounting considerations

- The scanner unit is generally installed either on top of the wheelhouse or on the radar mast, on a suitable platform. Locate the scanner unit where there is a good all-round view.
- No funnel, mast or derrick should be within the vertical beamwidth of the scanner in the bow direction, especially zero degrees ±5°, to prevent blind sectors and false echoes on the radar picture.
- It is rarely possible to place the scanner unit where a completely clear view in all directions is available. Thus, you should determine the angular width and relative bearing of any shadow sectors for their influence on the radar at the first opportunity after fitting.
- Locate the antenna of a direction finder clear of the scanner unit to prevent interference to the direction finder. A separation of more than two meters is recommended.
- To lessen the chance of picking up electrical interference, avoid where possible routing the signal cable near other onboard electrical equipment. Also avoid running the cable in parallel with power cables.
- A magnetic compass will be affected if placed too close to the scanner unit. Observe the following compass safe distances to prevent deviation of a magnetic compass: Standard compass, 5.0 m, Steering compass, 2.80 m.
- Do not paint the radiator aperture, to ensure proper emission of the radar waves.
- The signal cable run between the scanner and the display is available in lengths of 15 m (standard), 20 m, 30 m and 60 m. Whatever length is used it must be unbroken; namely, no splicing allowed.
- Deposits and fumes from a funnel or other exhaust vent can adversely affect the aerial performance and hot gases may distort the radiator portion. The scanner unit must not be mounted where the temperature is more than 70°C.
- The scanner base is made of cast aluminum. To prevent electrolytic corrosion of the scanner base, use the seal washers and corrosion-proof rubber mat and ground the unit with the ground wire (supplied).
- Leave sufficient space around the unit for maintenance and servicing. See the scanner unit outline drawing for recommended maintenance space.

Installation precaution for S-band scanner unit

If an S-band scanner unit is mounted near the end of a platform to provide sufficient rotation clearance for the radiator, the scanner unit, because of its weight, swings up and down by ship's vibration and rolling, exerting excessive levels of stress at the base of the radiator, which can damage the radiator. To prevent this, relocate the scanner unit, or if relocation is not possible, reinforce the platform.



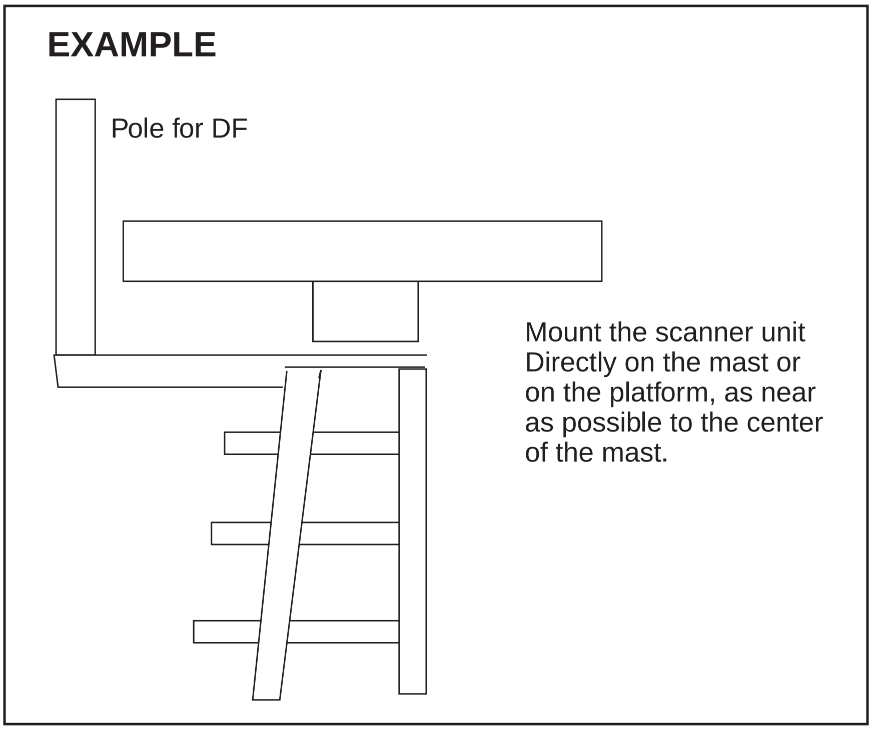


Figure 1-1 Mounting of S-band scanner unit

How to lift scanner unit

1. Fix the scanner radiator to the scanner unit chassis.
2. Attach the lifting fixtures and collars as shown in Figure 1-2 and 1-3.
3. Position the radiator as shown in Figure 1-3 and arrange the ropes A≑2m and B≑1.8m.

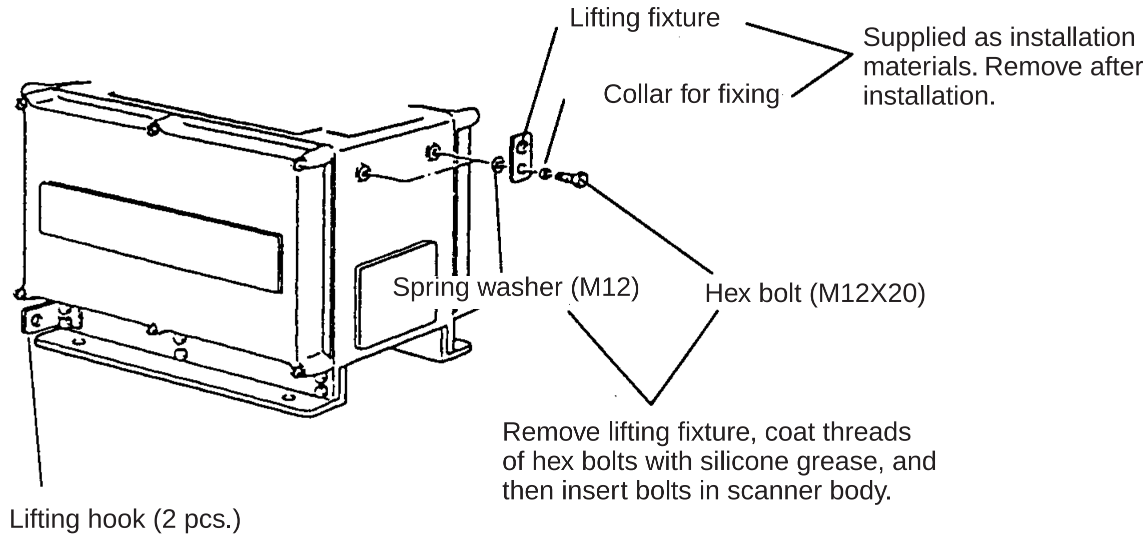


Figure 1-2 Attachment of lifting fixtures and collar

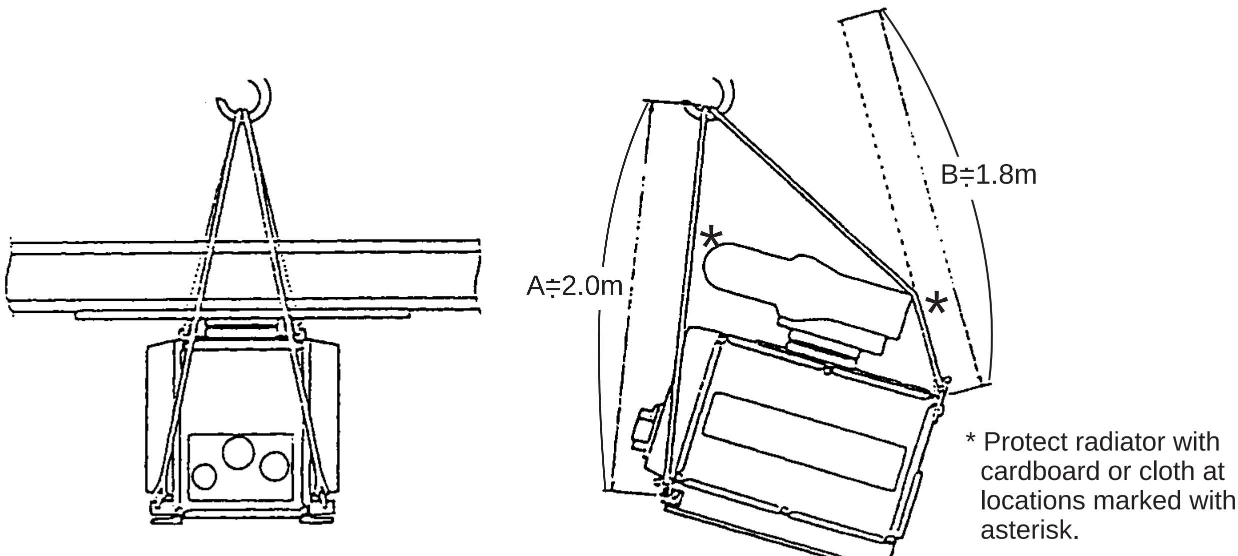


Figure 1-3 Attachment of ropes

Scanner unit assembling

The scanner radiator and the scanner housing are shipped in separate packages. Assemble them as below. The scanner unit may be assembled before hoisting it to the mounting platform. However, do not lift the scanner unit by the radiator.

Scanner unit assembling procedure

1. Screw the guide pins (2 pcs.) in the radiator.
2. Remove the protective cap from the choke guide.
3. Grease O-ring and set it to groove of the choke guide.
4. Place the radiator on the radiator bracket. (Radiator direction is shown by the logo on the bracket. If reversely oriented the radiator cannot be set to the bracket.)
5. Loosely fix the radiator to the radiator bracket with hex bolts (M10 x 25), spring washers and flat washers.
6. Remove the guides pins and tighten hexagon bolts.

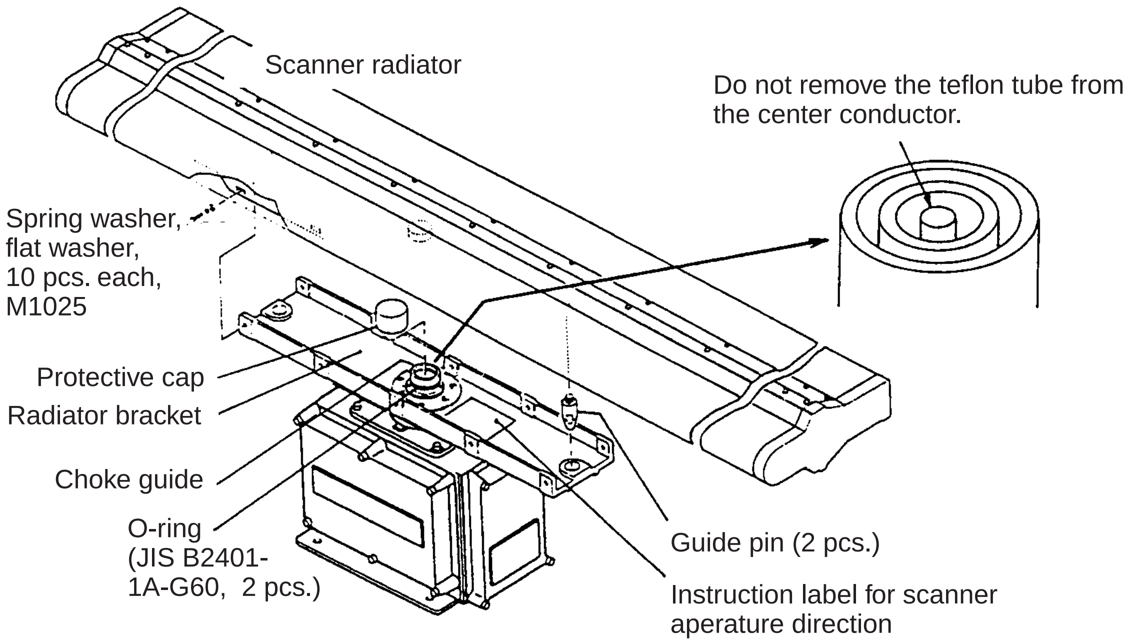


Figure 1-4 Assembling the radiator

> ⚠ **CAUTION**
>
> **Be sure to remove the guide pins.**
>
> Injury may result if the guide pins loosen and fall.

Fastening the scanner unit to the mounting platform

See the figure on the next page for scanner unit mounting.

1. Referring to the scanner outline drawing, drill four bolt holes (15 mm dia.) in the radar mast platform or the deck.
    - The diameter of the mast for fixing the scanner unit platform must be over 15 mm.
    - The thickness of the scanner unit platform must be over 15 mm.
    - The reinforcement ribs must be installed diagonally as shown below.

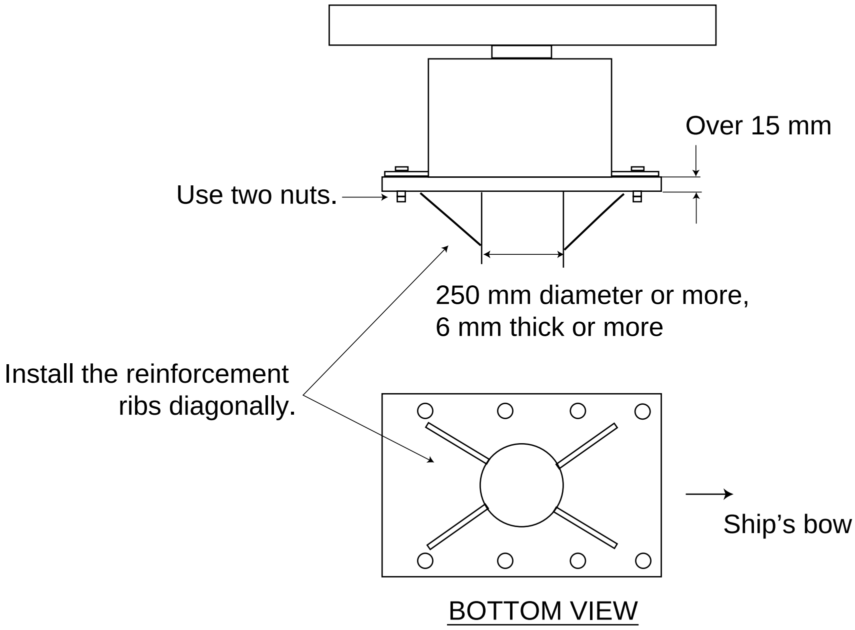


Figure 1-5 Installation of reinforcement ribs

2. Place the corrosion-proof rubber mat (supplied) on the mounting platform.
3. Hoist the scanner unit as shown on page 1-3 and place it on the rubber mat. Orient the cable gland toward the ship's stern (or port, starboard). Remove the lifting fixtures and collars.
4. Fix the scanner base to the mounting platform with four M12x70 hex bolts, nuts, washers and seal washers (supplied).
5. Arrange the grounding terminal at the nearest grounding spot with the M6x25 hex bolt, nut and washers (supplied). Then, fix a ground wire (RW-4747, 340 mm long) to the terminal.
6. Connect the other end of the ground wire to the ground terminal of the scanner unit.
7. Coat grounding terminal and fixing bolts on the scanner unit with silicone sealant (supplied).

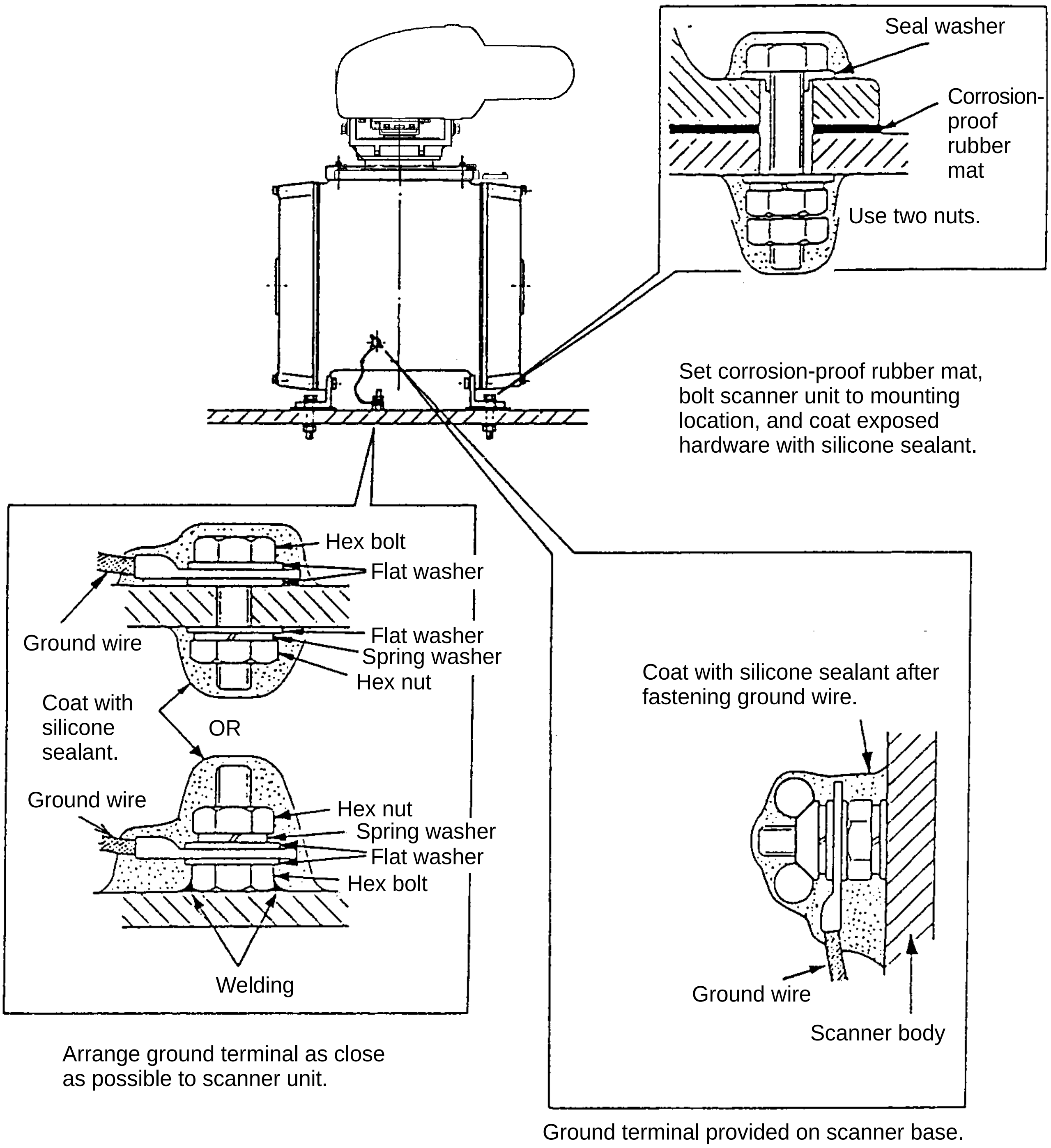


Figure 1-6 Mounting of scanner unit

1.2 Display Unit

Before mounting the display unit

If Gyro Converter GC-8 (option) is to be used, install and setup the GYRO CONVERTER Board before mounting the display unit, because of the difficulty involved in doing it after the display unit is installed. Instructions for installation and setup are in Chapter 4.

Mounting considerations

When selecting a mounting location, keep in mind the following points:

- Select a location where the display unit can be viewed and operated conveniently and where the screen can be viewed while facing towards the bow.
- Locate the unit out of direct sunlight and away from heat sources because of heat that can build up inside the cabinet.
- Locate the equipment away from places subject to water splash and rain.
- The display unit is very heavy. Be sure the mounting location is strong enough to support the weight of the unit under the continued vibration which is normally experienced on the ship. If necessary reinforce the mounting location.
- Determine the mounting location considering the length of the signal cable between the scanner unit and the display unit and the power cable between the display unit and Power Supply Unit PSU-004.
- Leave sufficient space on the sides and rear of the unit to facilitate maintenance. Also, leave a foot or so of “service loop” in cables behind the unit so it can be pulled forward for servicing or easy removal of connectors.
- A magnetic compass will be affected if placed too close to the display unit. Observe the following compass safe distances to prevent deviation of a magnetic compass: Standard compass, 1.70 m, Steering compass, 0.90 m.

Mounting procedure

Tabletop mounting

This procedure requires two people to complete.

1. Make four holes of 12 mm diameter referring to the outline drawing at end of this manual.
2. Unfasten the screws fixing the right and left brackets on the control head
3. Unfasten bolts (four total) in the brackets.

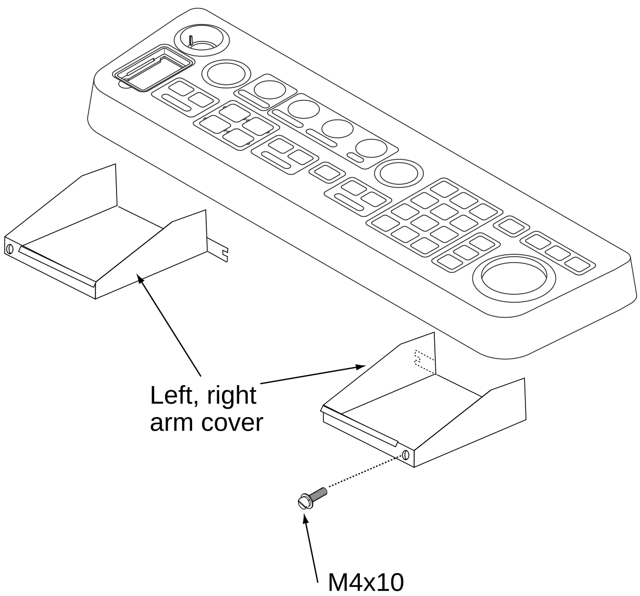


Figure 1-7 Control head

4. While one person is holding the mounting base at the sides, pull the handle on the underside of the control head to draw the display unit toward you until you hear a click.

> ⚠ **CAUTION**
>
> **Use two people to complete this step.**
>
> The display unit may fall to the deck when it is pulled forward, since the mounting base is not yet fastened to the mounting location.

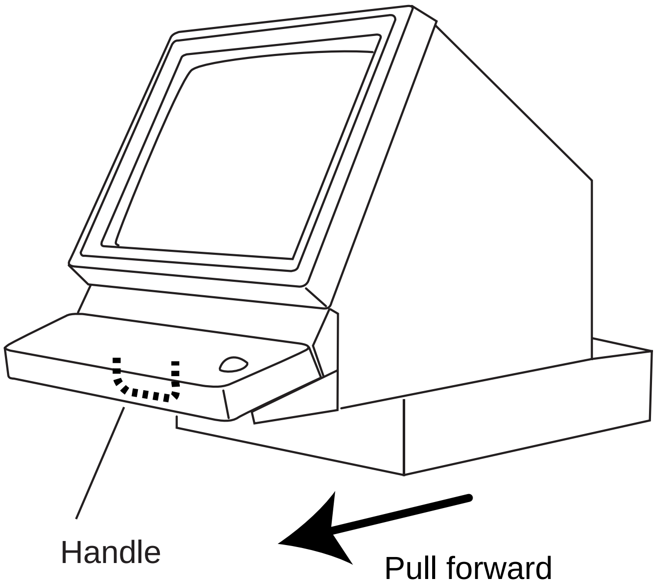


Figure 1-8 Display unit

5. This step requires two people to complete. While raising the monitor until the CRT is horizontal, fix the stay as follows:
   a) Raise the stay as shown below.

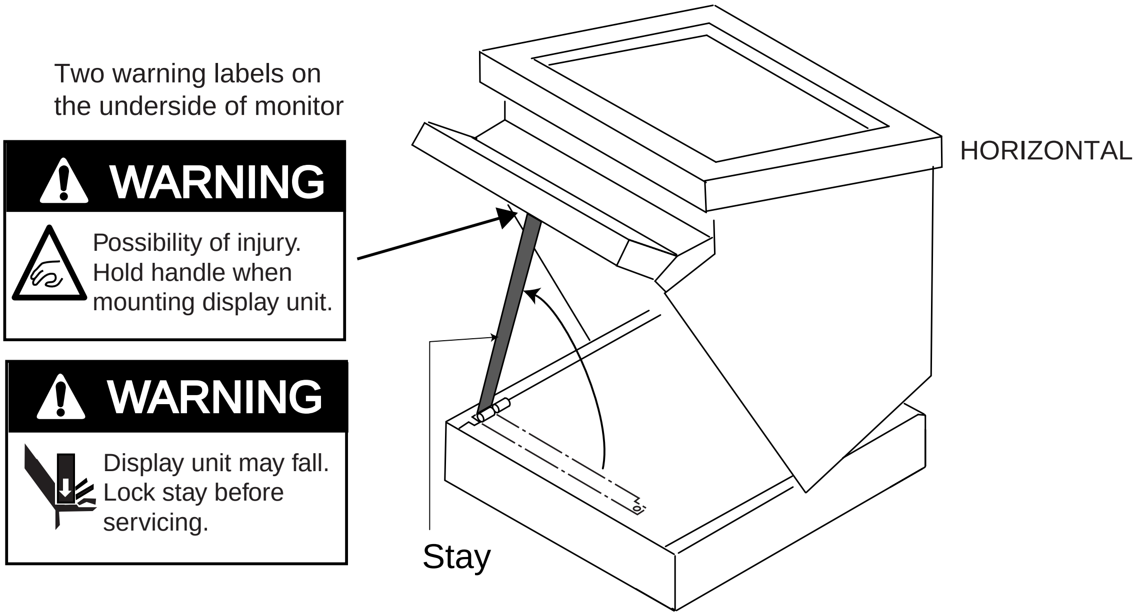


Figure 1-9 Display unit, inside view

   b) While pushing the stopper, set the catch on the display unit in the hole at the front edge of the stay.

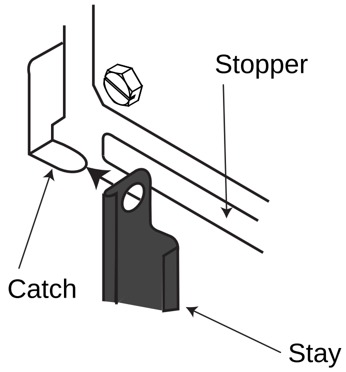


Figure 1-10 Setting catch to hole in stay

c) Release hand from stopper.

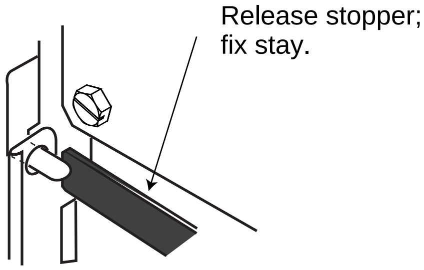


Figure 1-11 Stay fixed

6. Fasten the display unit to the mounting location at front fixing holes (2 points) with M10 bolts, nuts and flat washers, using the pipe box spanner (supplied).

   You cannot fasten the display unit at the rear fixing holes while the monitor is raised.

7. Retract the stay and lower the monitor.

8. Fasten the display unit to the mounting locations at rear fixing holes (2 points) with M10 bolts, nuts and flat washers, using the pipe box spanner (supplied).

   The rear left hole is hid under the PTU cover. Remove the cover as follows:

   (1) Unfasten five M3x8 screws at the top of the PTU cover and two M4x8 screws at the front of the cover to slide the cover toward the front side.

   (2) Remove the cover by grasping the knob on the top of the cover.

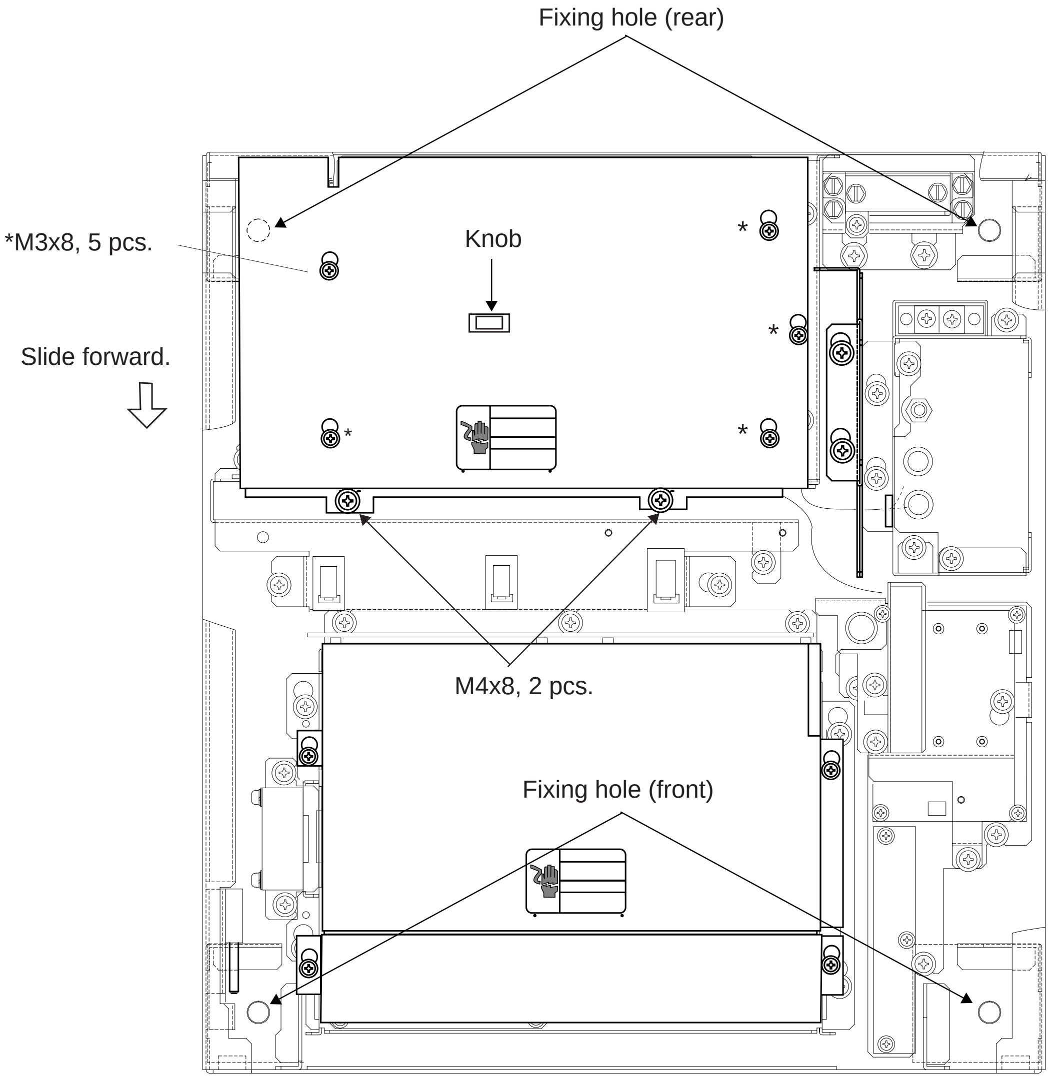


Figure 1-12 How to remove the PTU cover

9. Push the monitor forward until you hear a click.
10. Fix the brackets with the M10 bolts removed at step 2.

Console type mounting

1. Make six holes of 15 mm diameter and a cable entrance hole through the deck referring to the outline drawing at end of this manual.
2. Open the front cover.
3. Fix the equipment with M12 bolts, nuts and washers.
4. Hoist the console to the deck by using the eye bolts attached to the console. Remove the eye bolts and set the cosmetic caps to the eye bolt holes.

Separating the control head

The control head connects to the display unit with a connection cable, thus it can be located where desired, using the separate control head kit (option). Follow the procedure on the next page to separate the control head from the display unit.

Separate type control head kit (Type: OP03-151, No.: 008-485-530)

Name	Type	Qty	Code no.	Remarks
Cable Assy.	UL246SB20P/1P	1	000-140-812	10 m, 03S9422
Rubber Feet	SJ-5003	4	000-801-787	w/tape
Monitor Front Cover	03-255-1361	1	100-263-340	
KB Fixing Plate	03-144-1691	1	100-263-940	
Handle Plate	03-144-1632	1	100-268-041	
Dust cover KB	03-144-1693	1	100-271-760	
Screw	M4x10	3	000-881-446	
Label	86-003-1011	1	100-236-230	
Nonship Rubber	03-144-1694	1	100-271-760	

Display unit modification procedure

1. Raise the monitor unit referring to procedure for tabletop mounting on page 1-8.
2. Unplug two connectors from the control head cable (P412 from MOTHER Board and J583 and unfasten two earth wires.

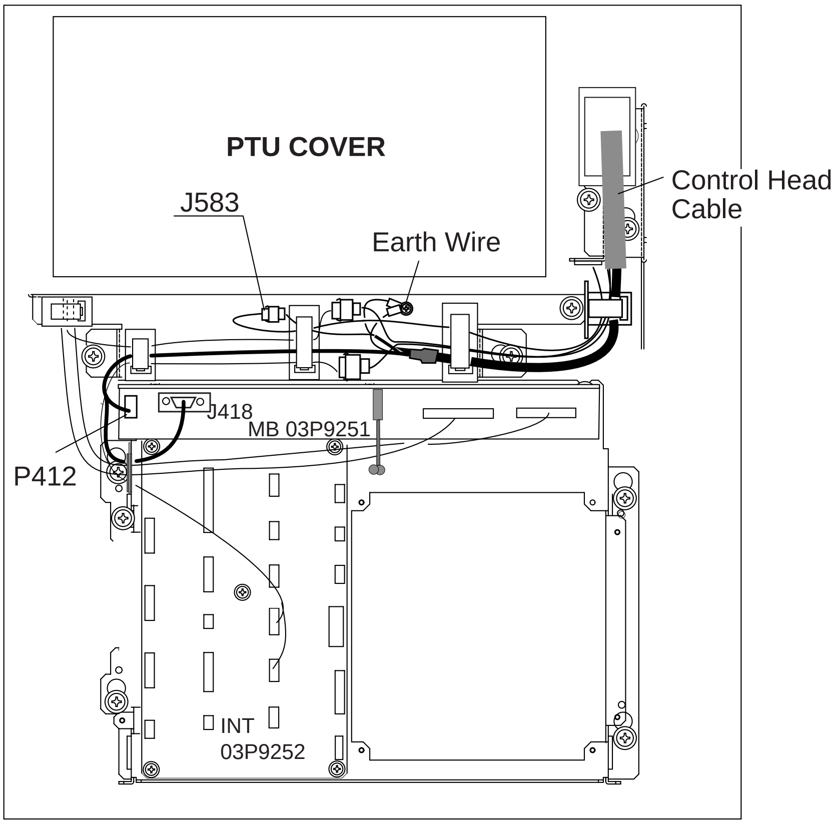


Figure 1-13 Display unit, inside view

3. Lower the monitor.

4. Unfasten the M4 screw fixing the ground terminal of the connection cable.
5. Push the monitor forward until you hear a click.
6. Unscrew four screws fixing the top cover of the display unit.
7. Remove three clamps fixing the connection cable in the monitor unit.
8. Unfasten four screws fixing the right and left brackets on the control head.
9. Unfasten four screws fixing the right and left covers of the display unit.
10. Unfasten six screws fixing the right and left KB arms.
11. Unfasten three screws fixing the panel cover.

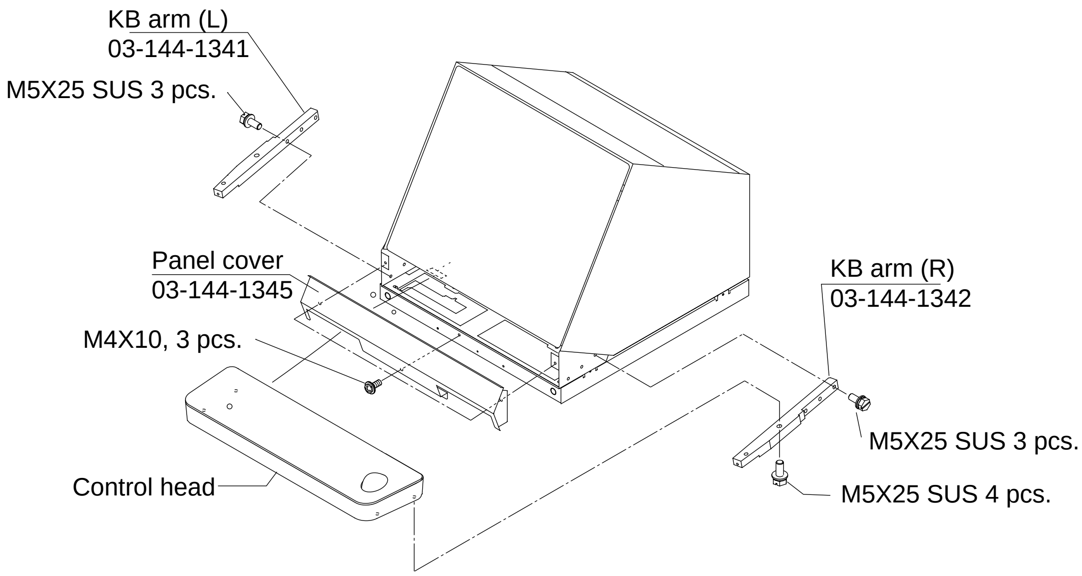


Figure 1-14 Detaching the control head

Control head modification procedure

1. Unfasten eight screws (M4X8) on the underside of the control head. Unplug connectors P314, P312 and P317 from the control head. Separate the KB bottom plate from the control head.
2. Unfasten the screw (M4) fixing the ground terminal and two screws (M4X8) fixing the clamp. Remove the connection cable assy.
3. Unfasten two screws (M6X12) from the inside of the bottom plate of the control head to dismount the handle.
4. Replace the cable assy. with cable assy. UL2464SB2-0P/1P (10 m, supplied) as below and reassemble the control head.

5. Paste warning label to the bottom plate.

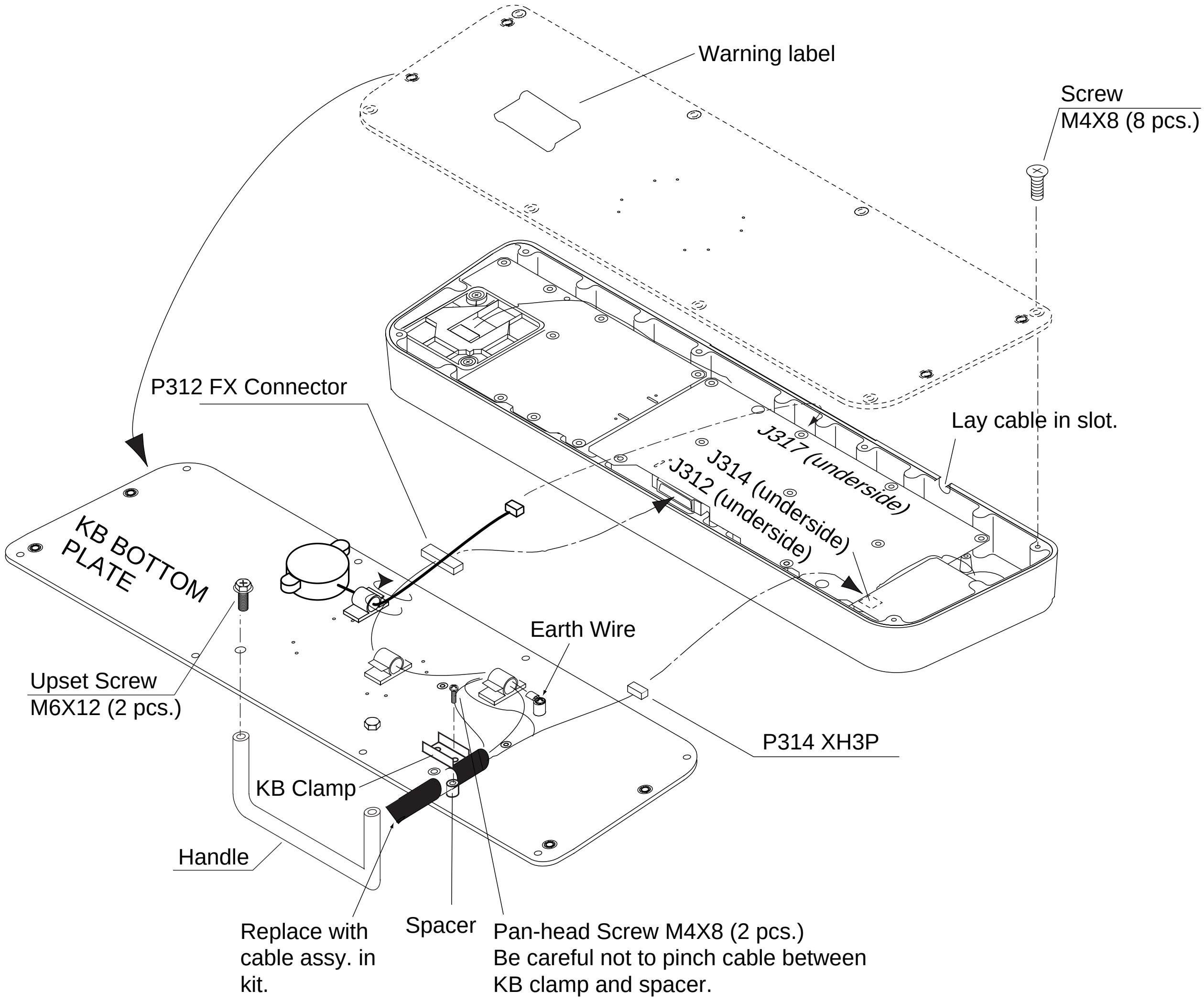


Figure 1-15 Control head

Connection of display unit to control head

Connection of display unit to control head

1. Attach the handle to the handle plate, using the screws for the handle and bottom cover of the control head.
2. Attach the handle plate to location where the KB arms were fastened.
3. Pull the monitor toward you until you hear click.
4. Lead in the cable assy. (option) from the rear entrance of the display unit. See Chapter 2.
5. Raise the monitor and fix the stay.
6. Inside the display unit, fasten ground wire of the cable assembly with an M4 screw on the chassis.
7. Plug in two connectors of connection cable (P412, J583: See illustration on the previous page.)
8. Lower the monitor.
9. Attach the monitor front cover (option) to the place the panel cover have been, using the screw for the panel cover.
10. Attach rubber to feet to the bottom of the keyboard if the keyboard is not going to be permanently fixed. To fix the keyboard to a desired location, fasten the KB fixing plate to the keyboard and desired location with two upset screws (M5X25, formerly used to fasten KB arms) and two tapping screws (ϕ6.5, local supply) as below.

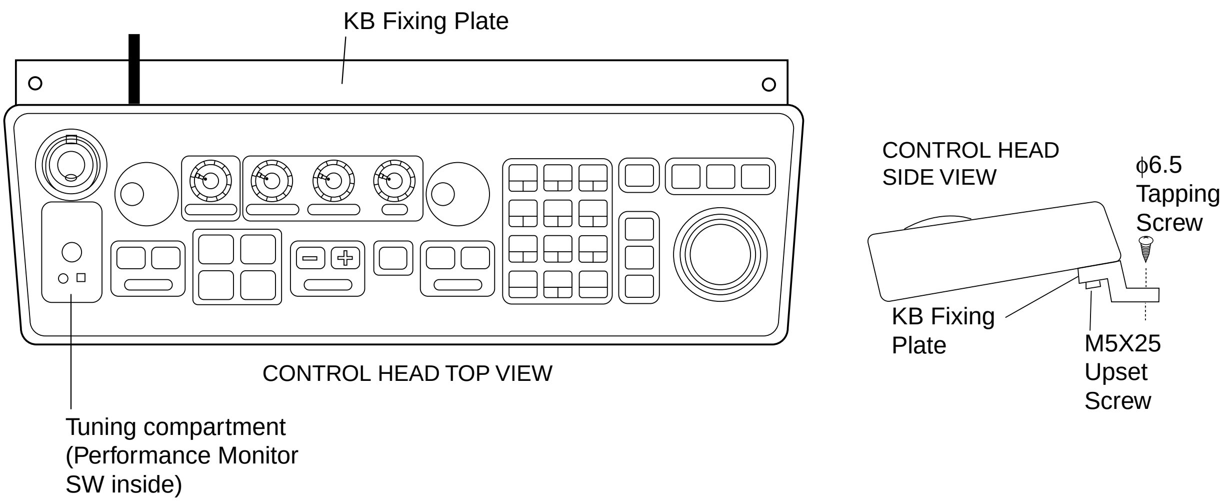


Figure 1-16 How to attach KB fixing plate

11. Set dust cover KB (supplied) on the control head.

Attachment of hood

1. Set two spacers (supplied) to the lower two of the four M5 holes in the CRT panel.
2. Screw two screws (supplied) into the holes in the hood.
3. Set the bottom of the hood to the screws at the bottom of the CRT panel, and then fasten the two screws at the top of the hood to the CRT panel.

1.3 Power Supply Unit

The Power Supply Unit PSU-004 does not contain usual operating controls. Therefore, it can be installed in any recessed place either in vertical or horizontal position. (For the console mount display unit, the PSU-004 can be installed inside the console.) However, select a dry and well-ventilated location and observe the compass safe distances below to prevent deviation of a magnetic compass: Standard compass, 0.50 m, Steering compass, 0.30 m. Fasten the unit to chosen location with four M6 screws.

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WIRING

2.1 Display Unit

Fabricating the power cable DPYCY-3.5 (JIS cable)

1. Remove the vinyl sheath by 80 mm.
2. Cut off jute tape wrapped around the armor.
3. Unravel the armor to expose the cores by about 35 mm.
4. Remove insulation of cores by about 10 mm. Fix crimp-on lugs to the cores and armor.
5. Cover the armor with vinyl tape, leaving the portion which will lie inside the cable clamp untaped.

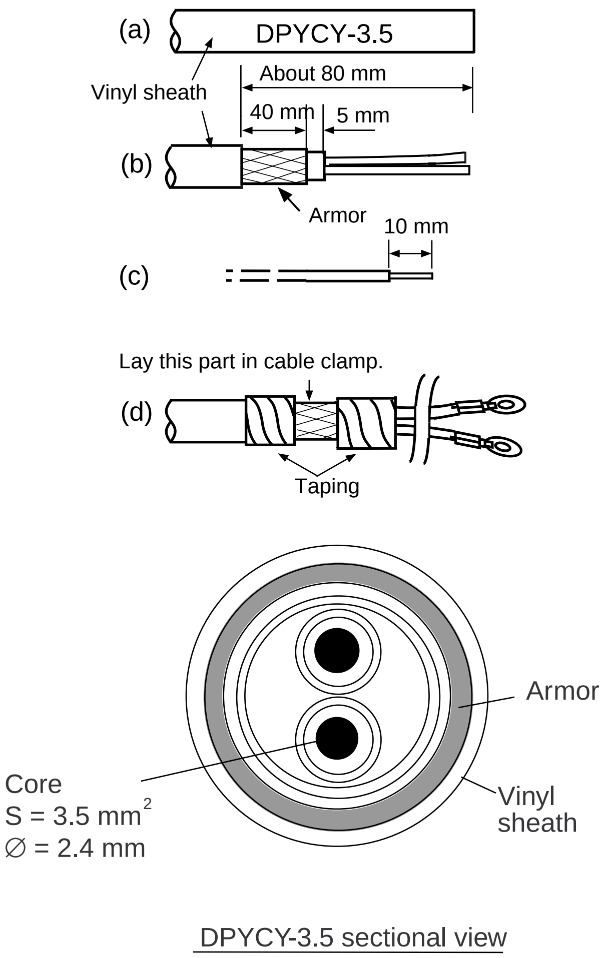


Figure 2-1 Fabrication of power cable DPYCY-3.5 (JIS cable)

Leading in cables to the display unit

The cable clamp may be positioned inside the display unit (default arrangement), outside the display unit or at the bottom of the display unit (when using console mount). When the cable clamp is located outside or beneath the display unit, use the bottom clamp front plate and bottom clamp rear plate (supplied with installation materials).

Also, use the shielding foam (supplied) to protect against noise radiation.

Cable fed from back of display unit (default method)

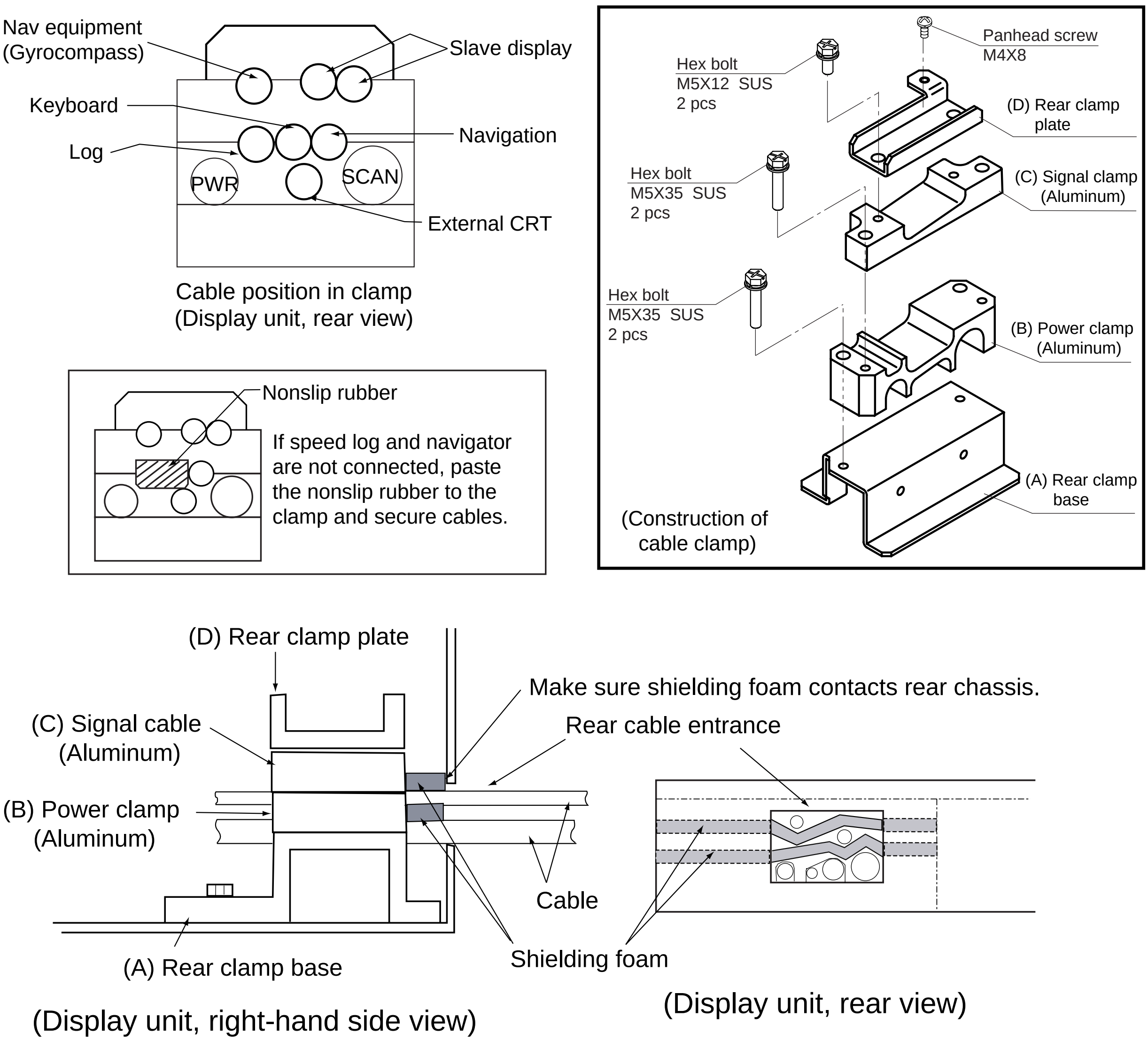


Figure 2-2 Default cable clamp position

- Place shielding foam between cables, and then attach the foam to aluminum clamps.
- Fill unused clamp holes with shielding foam.

Cable fed from outside display unit

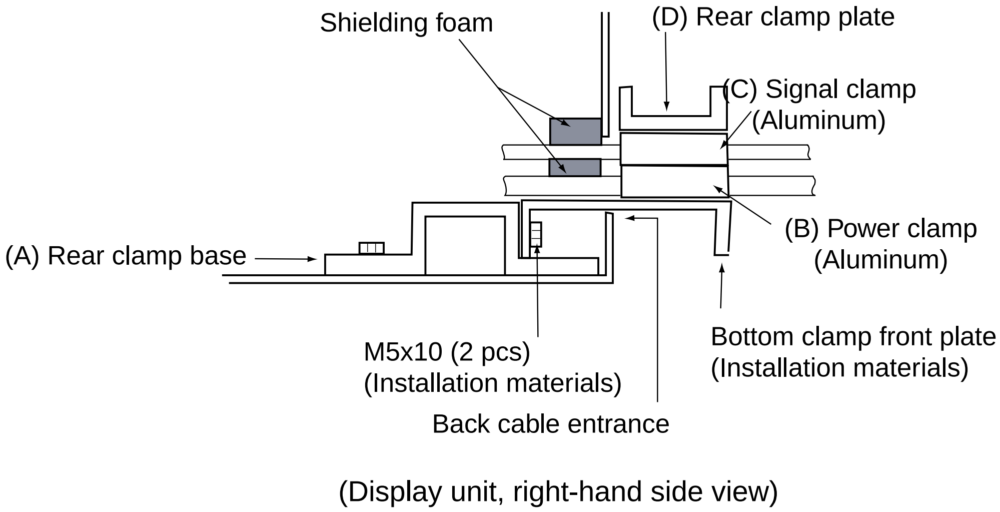


Figure 2-3 Clamp position outside display unit

- Place shielding foam between cables inside of display unit, and then attach foam to chassis.
- Fill unused clamp holes with shielding foam.

Cables fed from bottom of display unit (console mount)

Lead in cables through the cable clamp at the rear of the console and ground their shields in the cable clamp. For signal cable, remove vinyl sheath where cable lies in cable clamp. Fasten cables with cable ties.

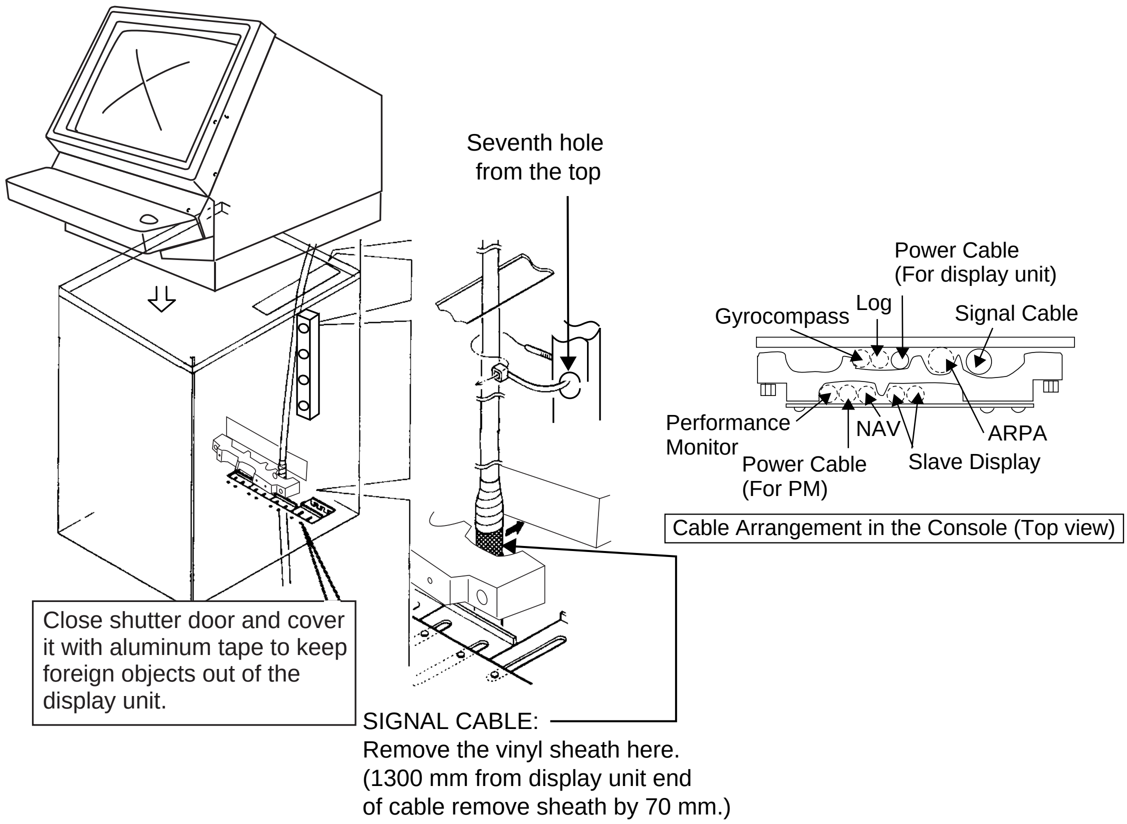
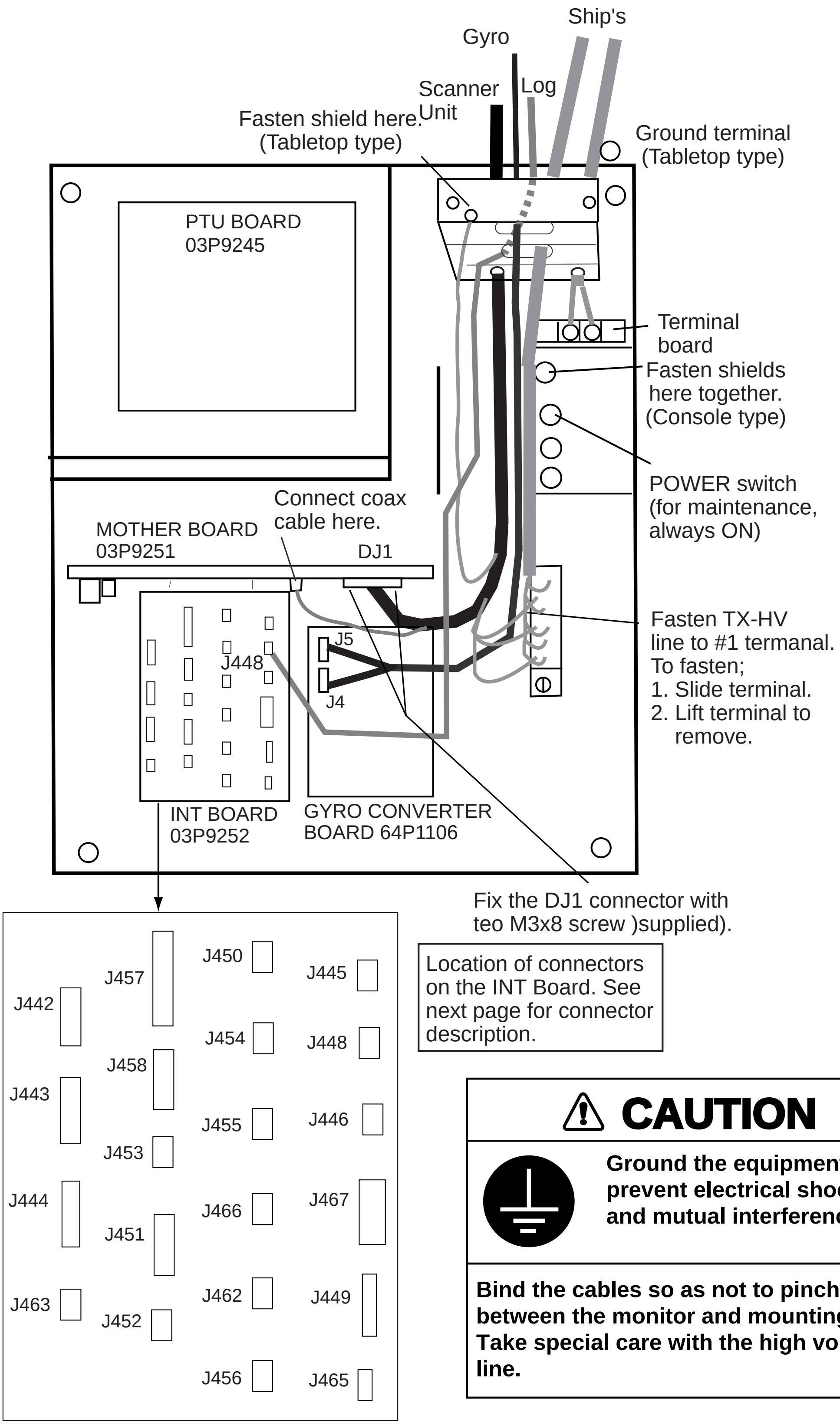


Figure 2-4 Clamp position at bottom of display unit

Connections

Open the display unit and fix it with the stay. (For procedure see page 1-6.) Remove the shield cover from the INT Board. Connect signal, power, gyro and log cables as shown on the next page. Optional equipment are connected to the INT Board. Be sure to ground the display unit.



⚠ CAUTION

Ground the equipment to prevent electrical shock and mutual interference.

Bind the cables so as not to pinch them between the monitor and mounting base. Take special care with the high voltage line.

Figure 2-5 Display unit, inside view

Connectors on the INT Board

Table 2-1 Connectors on the INT Board

Signal name	Name on pcb	Connector no.	Connector type	Applicable equipment	Remarks
Input Signal					
Gyro signal		J4, J5	VH, 3 pin, VH, 5 pin		*: On pcb A64P1106 (option)
Speed log signal	LOG	J448	NH, 3 pin		200 pulses/nm, etc.
Radar buoy signal	RADAR BUOY	J445	NH, 4 pin		
Remote display signal	EXT-RADAR or RJ-7	J458	NH, 8 pin		
Output Signal					
External ARPA signal	EXT-ARPA	J444	NH, 8 pin		Heading, bearing, Tx trigger
Slave display signal	SLAVE	J442 J443	NH, 8 pin	CD-140, CD-141, GD-500, GD-500MK2, FMD-800, FMD-8010 *1 *1: Display unit for FR-2105 series radar can be used as slave display unit.	Heading, bearing, video, Tx trigger
Buzzer signal	EXT-BUZ	J451	NH, 9 pin	Speaker w/amp	Speaker signal
Monitor signal		J449	NH, 10 pin		VER synchronous, HOR synchronous, video (NTSC format)
RS-232C	RS-232C	J456	NH, 4 pin		
Analog	ANALOG	J453	NH, 3 pin		
External buzzer	EXT ALARM (AC)	J452	NH, 3 pin		
Input/Output Signal					
INS data	INS. DATA	J455	NH, 5 pin		
RJ-7	RJ-7	J457 J458	NH, 15 pin NH, 8 pin		
Nav data	NAV DATA	J450	NH, 5 pin		
ARPA data	ARPA DATA	J454	NH, 5 pin		

Note: How to attach NH connector is shown on the next page.

How to attach NH connector

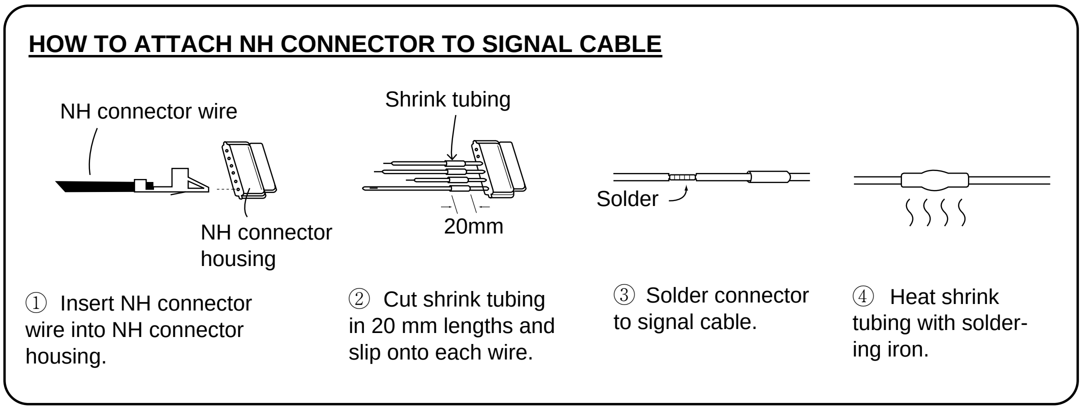


Figure 2-6 How to attach NH connector

2.2 Scanner Unit

Fabricating multicore cable 660V-MPYCY-12/250V-MPYCY-12 (JIS cable)

1. Shorten the multicore cable making the length from the cable gland to the cable end inside the scanner unit 450 mm. Remove the vinyl sheath of the cable by 450 mm; the armor by 440 mm.

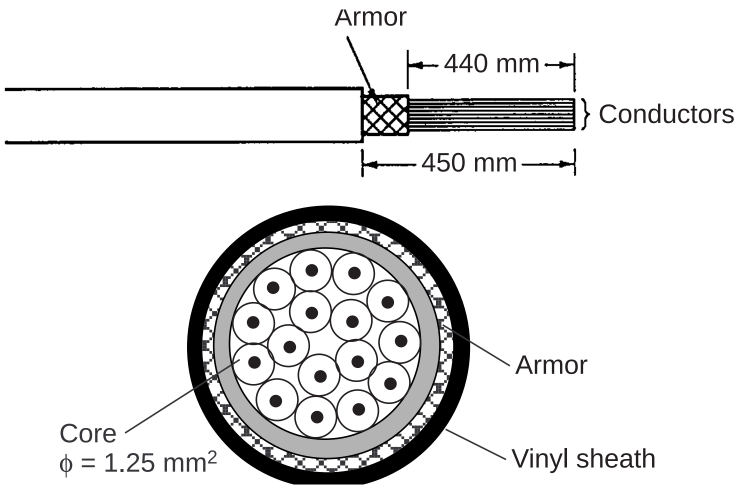


Figure 2-7 Fabrication of multicore cable 660V-MPYCY-12/250V-MPYCY-12

2. Turn off the ANT MOTOR SW on the scanner unit.

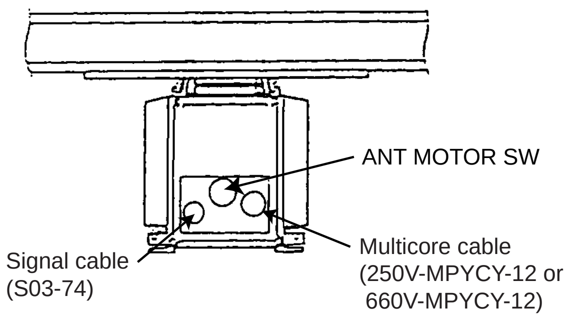


Figure 2-8 Scanner unit, bow view

3. Open the left side cover on the scanner unit with the hex wrench (supplied).
4. Unfasten the cable gland for the multicore cable and remove the gasket and flat washers.
5. As shown in Figure 2-9, slide the clamping gland, flat washers and gasket on the multicore cable.
6. Fold back armor by 5 mm and pass it through the two flat washers as shown in Figure 2-9.

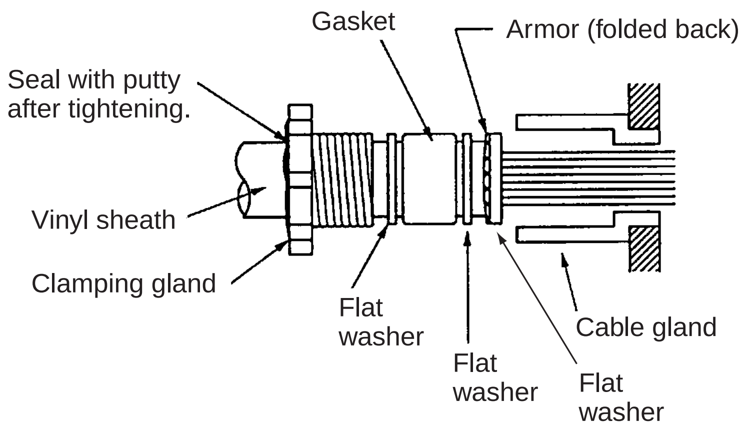


Figure 2-9 Passing clamping gland, washers and gasket on the multicore cable

7. Shorten conductors considering their locations on the terminal board STB-1.

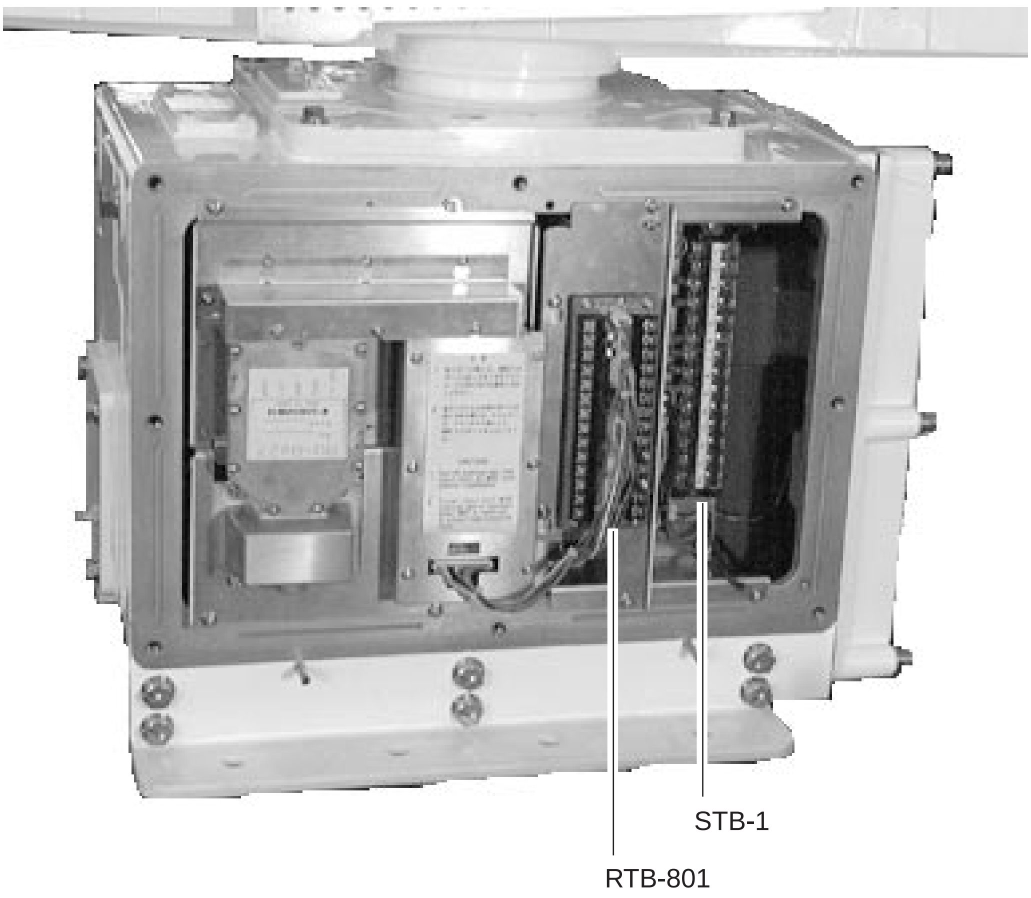


Figure 2-10 Scanner unit, port side view

8. Confirm that armor is grounded between two flat washers.

9. Remove the sheath of each conductor by 6 mm. Fix crimp-on lugs (FV1.25-4, blue, ø4) to each conductor. Make sure each connection is secure both electrically and mechanically.
10. Tighten the clamping gland.
11. Seal the cable gland with putty.
12. Connect the conductors to terminal board STB-1 referring to the interconnection diagram on page S-1.

Fabricating signal cable S03-74

13. At the signal cable gland on the scanner unit, unfasten the clamping gland and remove gasket and flat washers.
14. Shorten the signal cable making the length from the cable gland to the cable end 500 mm. Remove the vinyl sheath by 550 mm; the armor by 540 mm.

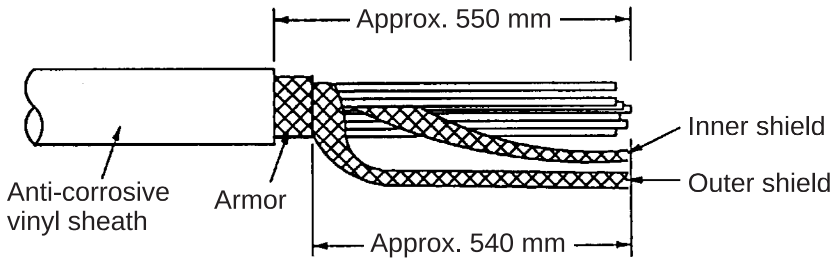


Figure 2-11 Fabricating the signal cable S03-74

15. Unravel the outer shield with a screwdriver or similar tool to expose the cores beneath the outer shield. Similarly, expose the cores beneath the inner shield. Mark all cores for future identification.
16. As shown in Figure 2-12, slide the clamping gland, washers and gasket onto the signal cable. Fold back the armor by 5 mm, and then pass it through the two flat washers.

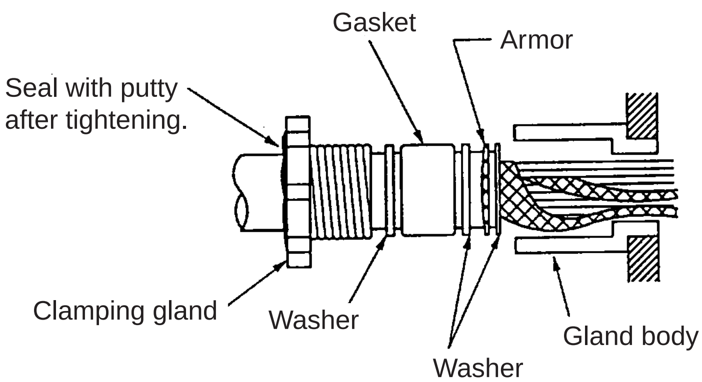


Figure 2-12 Passing clamping gland, washers and gasket on signal cable

17. Unfasten the terminal board RTB-801.
18. Pass the signal cable behind the terminal board plate for cable MPYCY-12, and then pass it through the locking wire saddle.

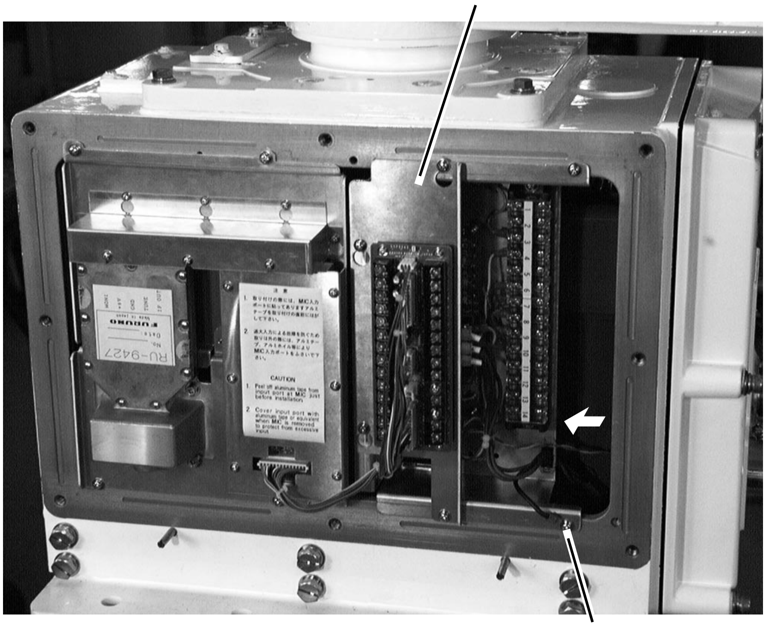


Figure 2-13 Scanner unit, rear view

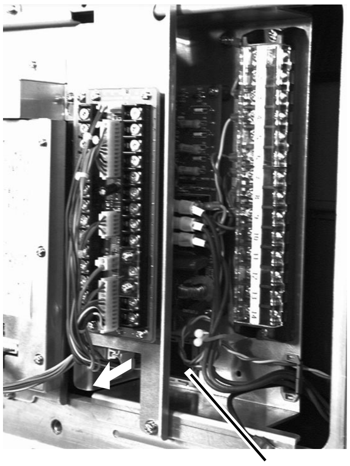


Figure 2-14 Scanner unit, rear view

19. Fasten the terminal board fixing plate for RTB-801.

20. Route the signal cable beneath the lower left side of the terminal board fixing plate for the RTB-801. Shorten conductors of the signal cable considering their locations on the RTB-801.

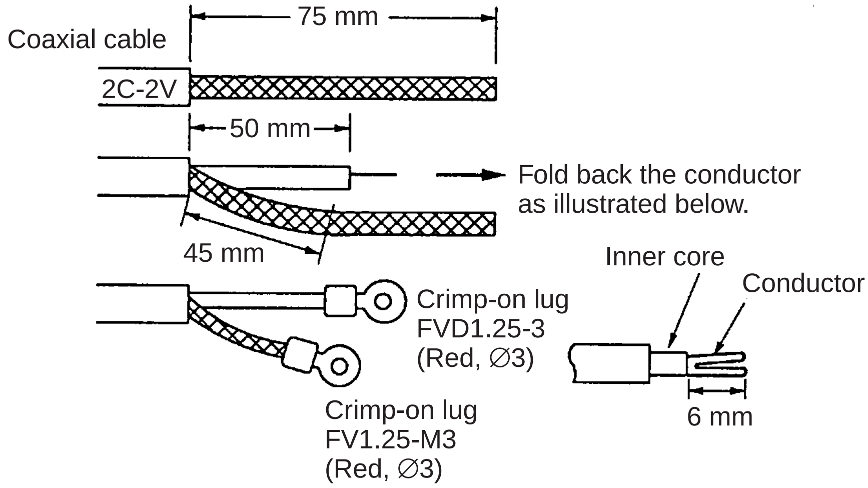


Figure 2-15 Fabrication of coaxial cable

21. Shorten the shield considering the distance to the ground terminal on the left side of the scanner unit chassis. (See Figure 2-13 for location.) Attach the crimp-on-lug FV5.5-4 (ø4, yellow) to the shield.

22. Remove approx. 6 mm of the vinyl insulation from the end of each conductor and fix the crimp-on lug FV1.25-M3 (Red) to each conductor. As shown in Figure 2-14, fold back the coaxial cable four times and attach the crimp-on-lug FVD1.25-3 (ø3, red). Attach the crimp-on-lug FVD1.25 (ø3, red) to the shield.

23. Tighten the clamping gland, and then seal the cable gland with putty.

24. Fasten the shield to the ground terminal on the scanner unit chassis.

25. Connect conductors to the terminal board RTB-801 referring to the interconnection diagram.

When the length of the signal cable is more than 150 m, remove the solder at terminal Nos. 24 (red) and 26 (black) on the DJ-1 connector. (#24 and #25 are spares.). Fasten the wires as shown below.

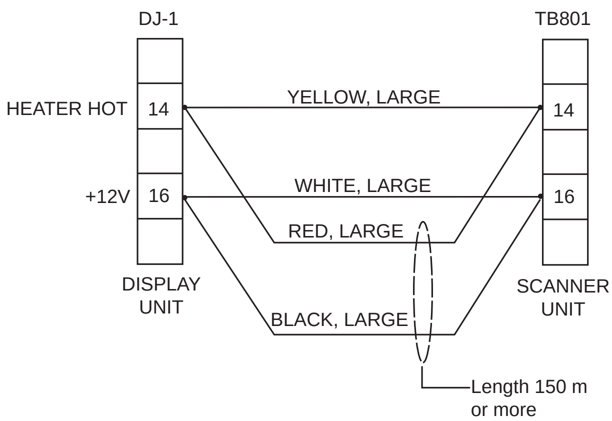


Figure 2-16 Wiring on terminal boards when length of signal cable is 150 m or more

26. Check for miswiring, loose screws. Grease the fixing bolts for the cover, gasket, and tap holes in the scanner chassis. Attach the cover.

When the de-icer is installed

1) Before beginning any work on the scanner unit, turn off the breaker for the de-icer line at the main switchboard to remove the power (100 VAC, 1ø) to the de-icer. (Turning off the power to the display unit has no effect.)
2) The neck of the scanner unit becomes VERY HOT when the de-icer is working. (The de-icer turns on when ambient temperature is below 0°C.)

2.3 Changing AC Power Specification of Display Unit

To operate the display unit from 100 VAC or 220 VAC power, add or delete jumper wires on the PTU Board and change the power fuses inside the display unit as shown in the table below. The figure below shows the location of the power fuses and the jumper wires on the PTU Board.

Table 2-2 Jumper wire setting on the PTU board, fuse rating and power specification

PCB	**Power Spec.**	**Antenna rpm**	**JP1**	**JP2**	**JP3**	**JP4**	**JP91**	**JP92**	**Power Fuses**
03P9245A	100/110/115 VAC	24 rpm	YES	YES	YES	NO	NO	NO	10A
03P9245D	220/230 VAC	24 rpm	NO	NO	NO	YES	NO	NO	5A

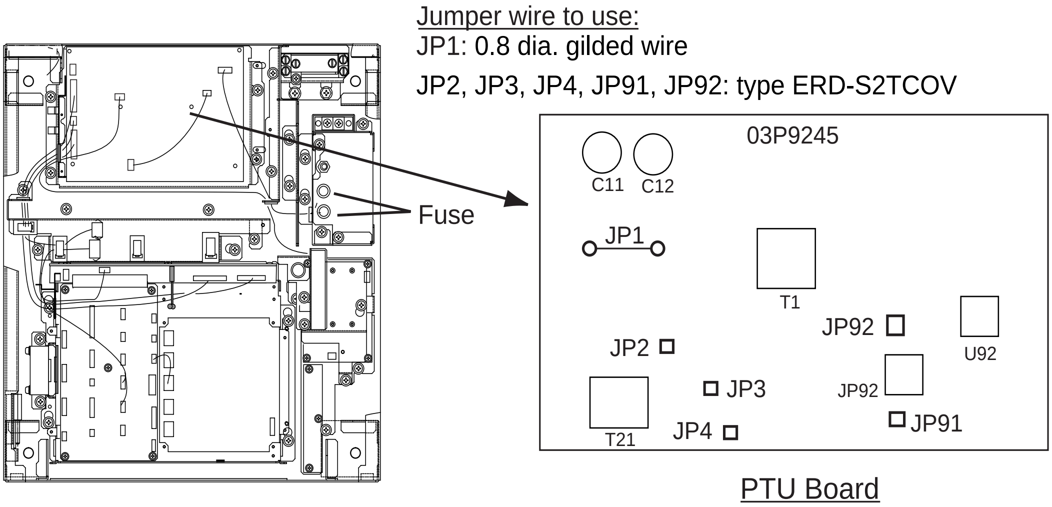


Figure 2-17 Display unit, inside view

2.4 Power Supply Unit

Wire the unit as shown in the interconnection diagram.

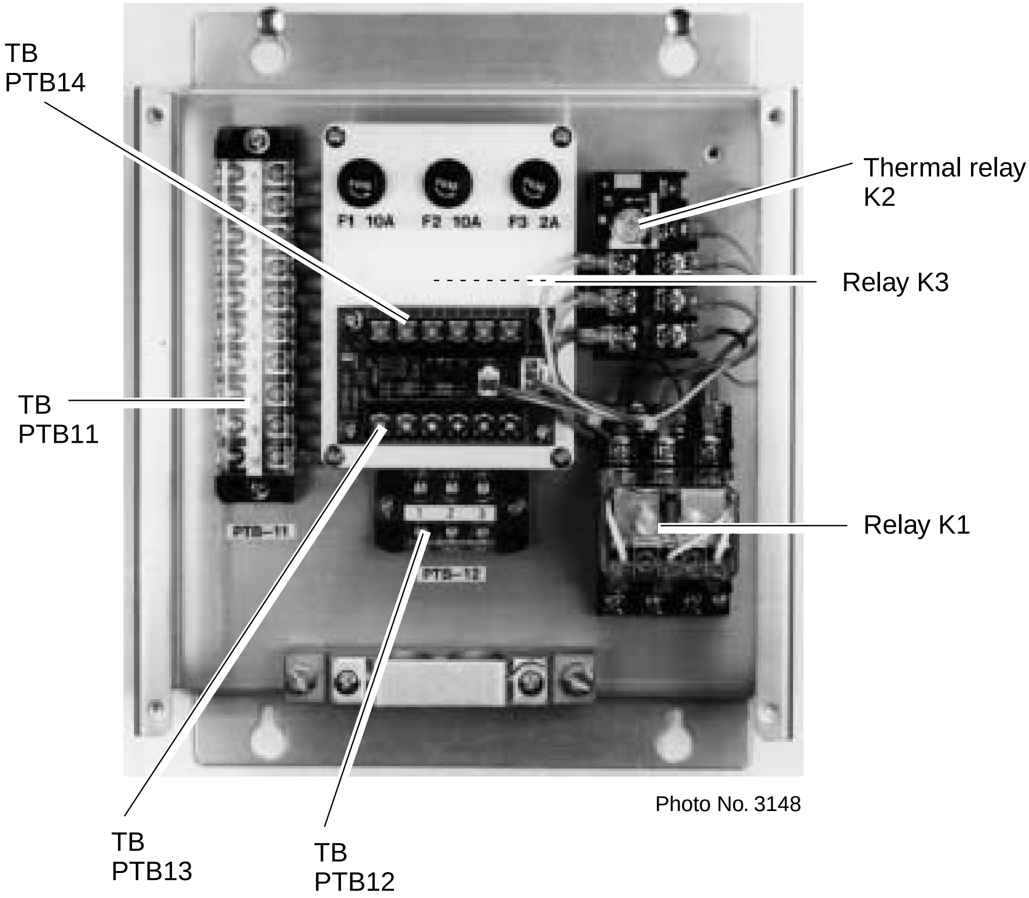


Figure 2-18 Power supply unit PSU-004

The type and rating of the thermal relay (K2) are as below.

Ship's Mains	Scanner Unit	Thermal Relay (K2)	
		Type	**Rating**
200/220VAC, 3ϕ	RSB-0026	TR0NH/3 1.7A	2.3A
380/440VAC, 3ϕ	RSB-0031	TR0NH/3 0.8A	1.0A
220VAC, 3ϕ, 50Hz	RSB-0088	TR0NH/3 1.7A	2.6A(MAX)*
220VAC, 3ϕ, 60Hz	RSB-0089	TR0NH/3 1.7A	2.6A(MAX)*
440VAC, 3ϕ, 60Hz	RSB-0090	TR0NH/3 0.8A	1.2A(MAX)*

*: Set the rating to maximum (2.3A to 2.6A or 1.0A to 1.2A) for HSC radar.

INITIALIZATION AND ADJUSTMENT

3.1 Tuning Initialization

Tune the radar as follows: Press [RADAR MENU] [0] [0] [2] [0] [0] [0] [0] (TUNE INITIALIZE on RADAR 3 menu) and press the [ENTER] key. Also, confirm that "2.MODEL" is set to "OTHER S-BAND" in the INTIAL SETTING 4 menu, referring to page 3-5. If the setting is wrong, trouble may result.

3.2 Accessing Menus for Initialization and Adjustment

To access them do the following:

1. Turn on the power.
2. Press the [RADAR MENU] key five times while pressing and holding down the [HL OFF] key.

Restoring default settings

1. Press [RADAR MENU] [0] [0] [0] [2] [0] [0] [0] to display the INITIAL SETTING 4 menu and [0] again.
2. Press the [0] key.
3. Press the [ENTER] key five times, and turn the power off and on again.
4. "Initializing" appears during restoring. It takes about 90 seconds to restore the default settings, after which the normal display appears.Confirm that "2.MODEL" is set to "OTHER S-BND" in the INITIAL SETTING 4 menu.

3.3 Adjusting Video Signal Level

When the signal cable is very long, the video amplifier input level decreases, shrinking target echoes. To prevent this, confirm (and adjust if necessary) video amplifier input level.

1. Connect an oscilloscope to TP6 on the INT Board (03P9252) in the display unit.
2. Transmit on the 12 nm range.
3. Adjust R21 on the INT Board so the value of TP6 is 4 Vpp. (For remote display, adjust R134 on the INT Board.)

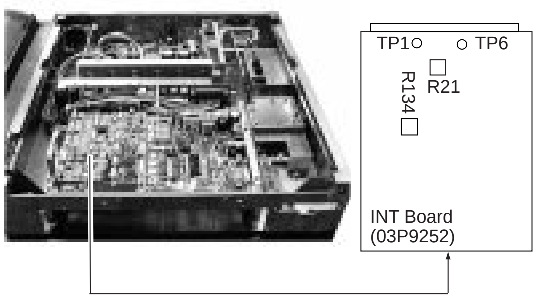


Figure 3-1 Display pedestal

3.4 Heading Alignment

You have mounted the scanner unit facing straight ahead in the direction of the bow. Therefore, a small but conspicuous target dead ahead visually should appear on the heading line (zero degrees).

In practice, you will probably observe some small bearing error on the display because of the difficulty in achieving accurate initial positioning of the scanner unit. The following adjustment will compensate for this error.

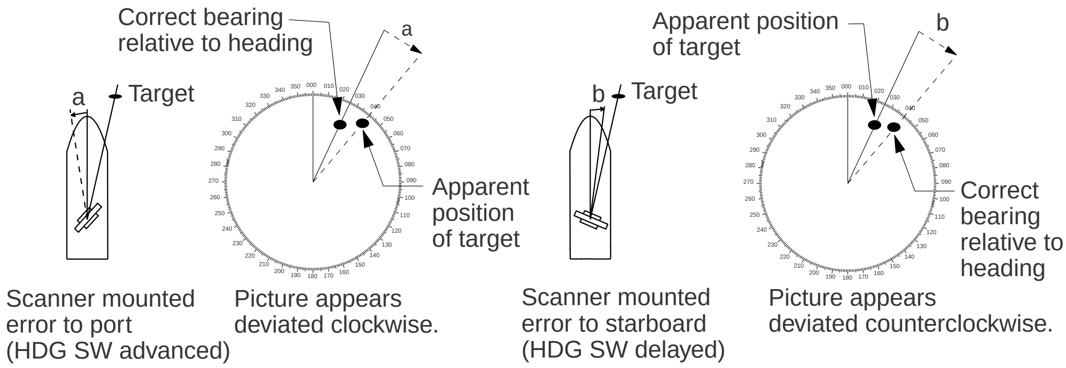


Figure 3-2 Heading alignment

1. Turn on the power. Press [RADAR MENU] [0] [0] [0] [2] [2] to select HL ALIGN on the INITIAL SETTING1 menu.
2. Select a target echo (by gyrocompass, for example) at a range between 0.125 and 0.25 nm, preferably near the heading line.
3. Operate the EBL control to bisect the target echo with the heading line. (The value shown on the display is scanner position in relation to ship's bow.)
4. Press [ENTER] to finish.

3.5 Adjusting Sweep Timing

Sweep timing differs with respect to the length of the signal cable between the scanner unit and the display unit. Adjust sweep timing at installation to prevent the following symptoms:

- The echo of a "straight" target (for example, pier), on the 0.25 nm range, will appear on the display as being pulled inward or pushed outward. See Figure 3-3.
- The range of target echoes will also be incorrectly shown.

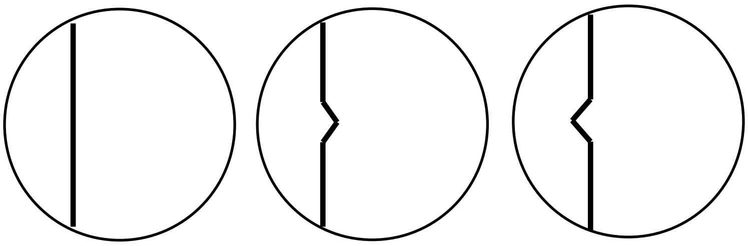


Figure 3-3 Examples of correct and incorrect sweep timings

1. Turn on the power. Press [RADAR MENU] [0] [0] [0] [2] [3] to select TIMING ADJ on the INITIAL SETTING1 menu.
2. Transmit on the 0.25 nm range.
3. Adjust radar picture controls to display picture properly.
4. Select a target echo which should be displayed straightly.
5. Adjust the VRM control to straighten the target echo.
6. Press [ENTER].

3.6 Suppressing Main Bang

If main bang appears at the screen center, suppress it as follows.

1. Turn on the power. Transmit on a long range and then wait ten minutes.
2. Adjust [GAIN] control to show a slight amount of noise on the display.
3. Select the 0.25 nm range. Adjust the [A/C SEA] control to suppress sea clutter.
4. Press [RADAR MENU] [0] [0] [0] [2] to open the INITIAL SETTING1 menu.
5. Press [7] to select 7. MBS.
6. Adjust the VRM control to adjust timing; the EBL control to adjust level.
7. Press [ENTER].

3.7 Confirming Magnetron Heater Voltage

Magnetron heater voltage is adjusted at the factory. Confirm that magnetron heater voltage is within the prescribed rating as follows:

1. Turn on the radar and select the 0.125 mile range.
2. Press [RADAR MENU] [0] [0] [0] [2] [0] to open the INITIAL SETTING2 menu.
3. Press [5] to select the 5. SCANNER STOPPED field and the TX option.
4. Turn off the antenna switch in the display unit.
5. Connect a multimeter, set to the 10 VDC range, between #12(+) of P801 and the chassis.
6. The multimeter should read 9.2-9.4 V. If not, adjust VR1.
7. “Transmit” on the 48 mile range.
8. The multimeter should read 7.3-8.3V.
9. Press [RADAR MENU] [0] [0] [0] [2] [0] [5] to select the 5. SCANNER STOPPED field and the ROTATE option.
10. Turn on the ANT MOTOR SW on the scanner unit.

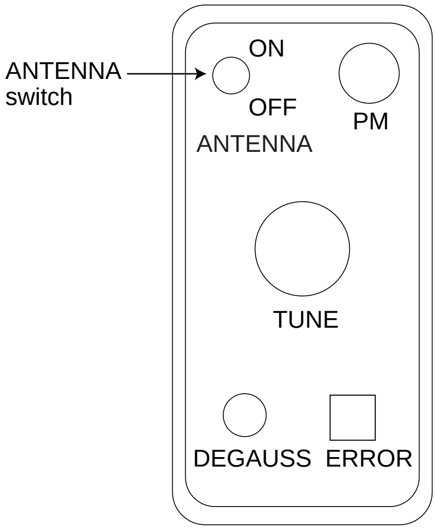


Figure 3-5 Antenna switch in tuning compartment

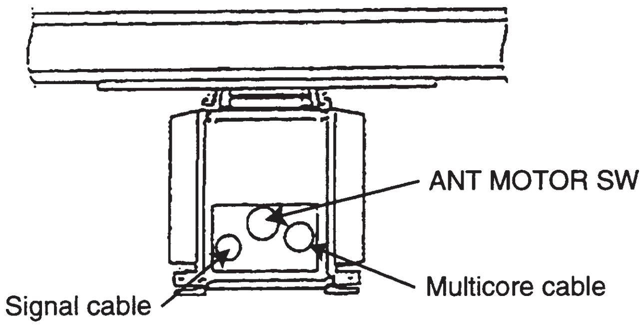


Figure 3-6 Scanner unit, bow view

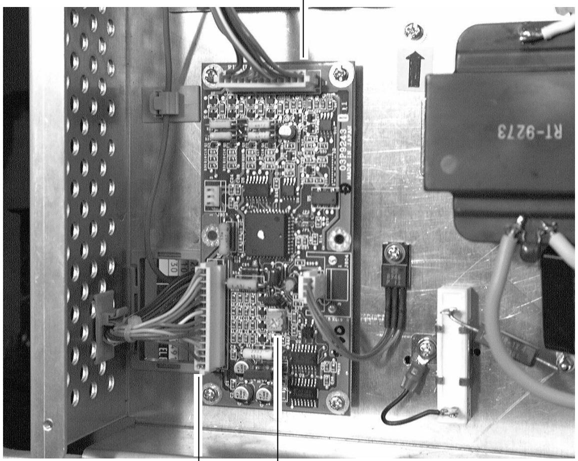


Figure 3-7 Scanner unit, stern side view

3.8 Initial Setting Menus

The INITIAL SETTING menu (four menus) and the OWN SHIP INFORMATION menu setup the radar according to expected usage, authorities specification, ship's characteristics, operator's preference, etc. Set items on each menu in accordance with regulations/operator's preference. After entering initial settings, reset the power.

Press [RADAR MENU] [0] [0] [0] [2]

[INITIAL SETTING 1]

1 [FUNCTIONS(4)]	
2 HL ALIGN	
	EBL 0.0°
3 TIMING ADJ	
	VRM 00.00
4 ANT HGT	5m/7m/10m/15m/ 20m/30mMORE
5 LOG PULSE	200P
6 [OWN SHIP INFORMATION]	
7 MBS	MBS TIMING VRM 0
	MBS LEVEL EBL 0
8 ON TIME	000000.0H
9 TX TIME	000000.0H
0 [INITIAL SETTING(2)]	

Press [6]

[OWN SHIP INFORMATION]

1 [INITIAL SETTING(1)]	
2 SHIP’S LENGTH	000m
3 SHIP’S WIDTH	00m
4 RADAR POSN	FOR BOW 000m
	FOR PORT 00m
5 NAV ANT POSN	FOR BOW 000m
	FOR PORT 00m
6 TURN RATE	00KT
	00.0° / s
	00KT
	00.0° / s
7 SPEED RATE	00KT
	0.00KT/s
	00KT
	0.00KT/s

Press [0]

[INITIAL SETTING 2]

1 [INITIAL SETTING(1)]	
2 LOG GYRO INPUT	LOG
	PULSE/SERIAL DATA
	GYRO
	AD/10/SERIAL DATA
3 OWN SHIP VECTOR	COMPASS/COURSE
4 KEY BEEP	ON/OFF
5 SCANNER STOPPED	ST-BY/TX
6 VIDEO SIG	ANALOG/DIGITAL
7 ALARM LEVEL	4/5/6/7
8 DISPLAY	MAIN/SUB
9 SECTOR BLKG	OFF/ON
	000° → 000°
	000° → 000°
0 [INITIAL SETTING(3)]	

Press [0]

[INITIAL SETTING 3]

1 [INITIAL SETTING(2)]	
2 TRAILS RESTART	OFF/ON
3 ECHO AVG W/O GYRO	OFF/ON
4 HEAD UP TB SCALE	DEG/16POINT
5 CTR ECHO STRETCH	OFF/ON
6 VIDEO CONTRAST	1/2/3
7 MAXIMUM RANGE	72/96/120
8 ECHO FULL COLOR	OFF/ON
9 INDEX LINES	2/3/6
0 [INITIAL SETTING(4)]	

Press [0]

[INITIAL SETTING 4]

1 [INITIAL SETTING(3)]	
2 MODEL	FR-2115, 2125/ OTHER X-BND/ FR-2165DS, 2135SW/ OTHER S-BND
3 TYPE	R/N/G/D
4 CTR STC CURVE	L/M/H
5 RJ-7	OFF/ON
6 RJ-8	OFF/ON
	ANT A
	FR-2115, 2125/ OTHER X-BND/ FR-2165DS, 2135SW/ OTHER S-BND
	ANT B
	FR-2115, 2125/ OTHER X-BND/ FR-2165DS, 2135SW/ OTHER S-BND
7 SHIP’S TYPE	DEEP SEA/FISHING/ LONG LINE FISHING
8	
9 CABLE LENGTH	500m/5000m
0 FACTORY DEFAULT	

INITIAL SETTING1 menu

Keying sequence: [RADAR MENU] [0] [0] [0] [2]

HL ALIGN: Aligns heading.

TIMING ADJ: Adjusts sweep timing.

ANT HGT: Enter height of scanner above water. Select from 5 m, 7 m, 10 m, 15 m, 20 m, or more than 30 m.

LOG PULSE: Enter speed log's pulse rate.

OWN SHIP INFORMATION: Enter ship's characteristics; length, width, radar scanner position, navigation antenna position, turn rate, and speed rate. See the description on the next page for further details.

MBS: Suppresses main bang.

ON TIME, TX TIME: Shows number of hours the radar has been turned on and transmitted, respectively. Value can be changed.

INITIAL SETTING2 menu

Keying sequence: [RADAR MENU] [0] [0] [0] [2] [0]

LOG GYRO INPUT: Select LOG or GYRO input type. LOG: Select pulse or serial data. GYRO: Digital from A/D converter or serial data.

OWN SHIP VECTOR: Select reference for own ship vector; compass or course.

KEY BEEP: Turns key response beep on or off.

SCANNER STOPPED: Set to ST-BY in normal use. TX enables transmission state without scanner rotation.

VIDEO SIG: Set to ANLG (analog) for normal use. Select DIGITAL to adjust QV (Quantized Video).

ALARM LEVEL: Sets echo strength which triggers guard alarm. "7" is strongest echo; "4" is medium strength echo.

DISPLAY: Select radar display function; main or sub (slave).

SECTOR BLKG: Sets area (up to 2) where no radar pulses will be transmitted. For example, set the area where an interfering object at the rear of the scanner would produce a dead sector (area where no echoes appear) on the display. To enter an area, select ON and enter relative bearing range of the area.

INITIAL SETTING3 menu

Keying sequence: [RADAR MENU] [0] [0] [0] [2] [0] [0]

TRAILS RESTART: Selects whether to restart or discontinue target trails when changing the range. ON restarts trailing on newly selected range; OFF discontinues trails.

ECHO AVG W/O GYRO: Echo averaging can be turned on without gyrocompass connection.

HEAD UP TB SCALE: Bearing scale may be shown in degrees or compass points in the head-up mode.

CTR ECHO STRETCH: Turn on to enlarge echoes in the range up to the first range ring.

VIDEO CONTRAST: For factory use. Do not change setting.

MAXIMUM RANGE: For factory use. Do not change setting.

ECHO FULL COLOR: Echoes may be displayed in one color or multi-color. Select ON for multi-color display.

INDEX LINES: Selects the number of index lines to display; 2, 3, or 6.

INITIAL SETTING4 menu

Keying sequence: [RADAR MENU] [0] [0] [0] [2] [0] [0] [0]

MODEL: Selects radar model.

TYPE: Selects specification of radar. Select R for R type; G for IMO type.

CTR STC CURVE: Selects level of STC affect; Low, Medium or High.

RJ-7, RJ-8: Selects which Interswitch unit to use.

SHIP'S TYPE: Select class of vessel; deep sea, fishing, long line fishing.

CABLE LENGTH: Set for "500."

FACTORY DEFAULT: Restores all menus' default settings.

OWN SHIP INFORMATION menu

Keying sequence: [RADAR MENU] [0] [0] [0] [2] [6]

SHIP'S LENGTH: Enter ship's length.

SHIP'S WIDTH: Enter ship's width.

RADAR POSN: Enter distance from both bow and port to the radar antenna location.

NAV ANT POSN: Enter distance from both bow and port to the navigation antenna location.

TURN RATE: Enter ship's turn rate.

SPEED RATE: Enter ship's speed rate.

INSTALLATION OF OPTIONAL EQUIPMENT

4.1 Gyro Converter GC-8

The Gyro Converter GC-8, incorporated inside the radar display unit, converts analog gyrocompass reading into digital coded bearing data for display on the radar display.

This section explains how to install and setup the GC-8 (mainly consisting of the GYRO CONVERTER Board) and set it up according to gyrocompass connected.

Installation and connection of the GYRO CONVERTER Board

Necessary Parts: GC-8-2 (008-446-520)

Name	Type	Qty	Code No.
Gyro Converter Board	64P1106	1	004-412-220
Screws	M3x8, C2700W	5	000-881-404
Sticker	64-014-20211	1	100-132-701

1) Turn off the power.
2) Open the display unit. See Chapter 1 for instructions.
3) Fasten the GYRO CONVERTER Board inside the display unit with four washerhead screws (supplied).

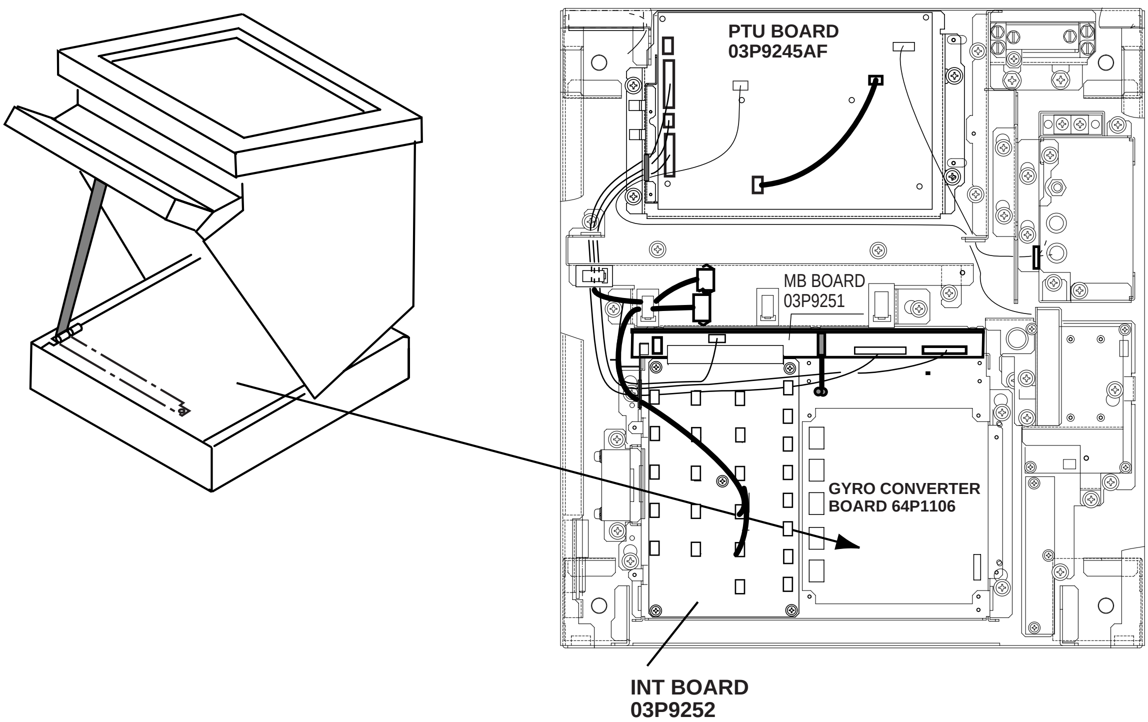


Figure 4-1 Display unit, inside view

4) Connect the GYRO CONVERTER Board to the INT Board (cables supplied with GC-8) as shown below.

INT Board		GYRO CONVERTER Board
J446 (4P)	↔	J7 (5P)
J465 (6P)	↔	J1 (14P)

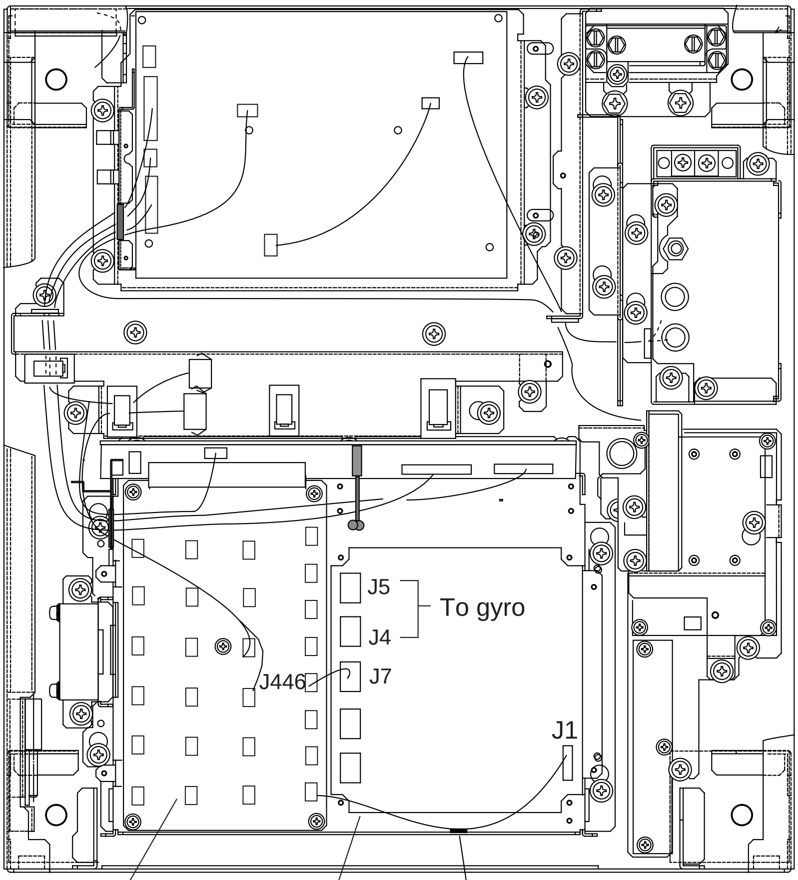


Figure 4-2 Display unit, inside view

5) Confirm gyrocompass specifications and set up the DIP switches and jumper wires on the GYRO CONVERTER Board according to gyrocompass connected:
   - Setting jumper wires and DIP switches by gyrocompass specifications: page 4-3
   - Setting jumper wires and DIP switches by make and model of gyrocompass: page 4-5
   - Location of jumper wires and DIP switches: page 4-6
6) Solder the gyrocompass cable to the VH connector assemblies (supplied).
7) Attach instruction label (supplied).
8) Close the display unit.
9) Turn the power off and on to reset the CPU.

Connection of external power supply

An external power supply is necessary when the repeater signal is step-by-step type and the step voltage is below 20V or output voltage is less than 5 W.

1. Cut jumper wire JP1 on the GYRO CONVERTER Board when an external power supply is used.
2. Connect gyro cable and power cable as shown below.

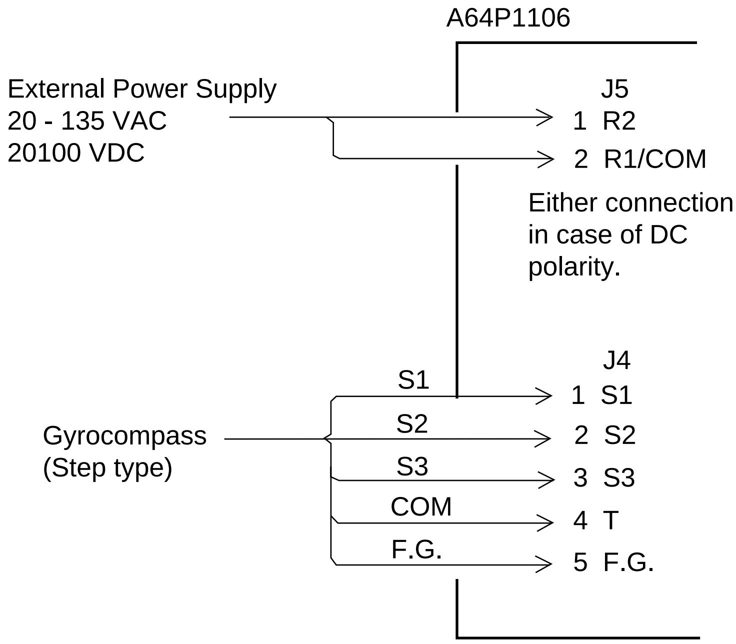


Figure 4-3 Connection of external power supply to GYRO CONVERTER Board

DIP switch, jumper wire settings

Default setting

The default setting of all DIP switches is off and all jumpers wire are set to "#1." (Note that jumper wire JP1 is set at #1, #2, and #3.) In those settings the gyrocompass having the following characteristics can be directly connected; modification of the GYRO CONVERTER Board is not necessary.

AC synchronous signal: 50/60 Hz
Rotor voltage: 60 V to 135 V AC
Stator voltage: 60 V to 135 V AC
Gear ratio: 360x
Supply voltage: 30 V to 135 V AC

If the specifications of the gyrocompass differ from those mentioned above, change jumper wire and DIP switches settings on the GYRO CONVERTER Board. Settings may be changed according to gyrocompass specifications or make and model of gyrocompass (see page 4-5). For the location of DIP switches and jumper wires, see page 4-6.

Setting method 1: by gyrocompass specifications

1) Gyrocompass type

Gyrocompass type	SW 1-4	SW 1-5	SW 1-6	JP1
AC synchronous	OFF	OFF	OFF	#1, #2, #3
DC synchronous	OFF	OFF	OFF	#2, #3, #4
DC step	ON	OFF	OFF	#4, #5, #6
Full-wave pulsating current	OFF	ON	OFF	#4, #5, #6
Half-wave pulsating current	ON	ON	OFF	#4, #5, #6

2) Frequency

Frequency	SW 1-7	SW 1-8	Remarks
50/60Hz	OFF	OFF	AC synchronous pulsating current
400Hz	ON	OFF	AC synchronous pulsating current
500Hz	OFF	ON	AC synchronous pulsating current
DC	ON	ON	DC synchronous DC step

3) Rotor voltage (between R1 & R2)

Rotor voltage	SW 2-1	JP3
20 V to 45 VAC	ON	#2
30 V to 70 VAC	OFF	#2
40 V to 90 VAC	ON	#1
60 V to 135 VAC	OFF	#1

4) Stator voltage (between S1 and S2)

Stator voltage	SW 2-2	SW 2-3	JP2
20 V to 45 VAC, or 20 V to 60 VDC	ON	OFF	#2
20 V to 45 VAC, or 20 V to 60 VDC	OFF	OFF	#2
40 V to 90 VAC	ON	OFF	#1
60 V to 135 VAC	OFF	OFF	#1

5) Ratio

Ratio	SW1-1	SW 1-2	SW1-3
360x	OFF	OFF	OFF
180x	ON	OFF	OFF
90X	OFF	ON	OFF
36X	ON	ON	OFF

6) Supply voltage

Supply voltage	JP4	JP5
20 V to 45 VAC, or 20 V to 60 VDC	#2	#2
30 V to 135 VAC, or 40 V to 100 VDC	#1	#1

7) AD-10 format data Tx interval

Select data transmitting interval for ports 1 to 6 by jumper wires JP6 and JP7.

Note: The Tx interval is available in 25 ms or 200 ms.
25 ms is for radar; 200 ms is for all other equipment.

8) NMEA-0183 Tx interval and Output sentence

Tx interval	SW 2-5	SW 2-6	Output sentence
1 s	OFF	OFF	HDT+VHW
200 ms	ON	OFF	HDT
100 ms	OFF	ON	HDT
25 ms	ON	ON	HDT

9) NMEA-0183 Version no.

Version no.	SW3-1
1.5	OFF
2.0	ON

10) NMEA-0183 Baud rate

Baud rate	SW3-2
4860bps	OFF
38400bps	ON

11) NMEA-0183 Talker

Talker	SW3-3
AG	OFF
HE	ON

Setting method 2: by make and model of gyrocompass

Maker	Models	Specification	SW 1-1	SW 1-2	SW 1-3	SW 1-4	SW 1-5	SW 1-6	SW 1-7	SW 1-8	SW 2-1	SW 2-2	SW 2-3	JP1	JP2	JP3	JP4	JP5
FURUNO	GY-700	DC step 100V 180x 5-wire, open collector	ON	OFF	OFF	ON	OFF	OFF	ON	ON	-	OFF	OFF	#4, #5,#6	#2	-	#1	#1
Anschutz	Standard 2,3	AC synchronous 50/60Hz Rotor voltage: 50/60V Stator voltage: 22V 360x	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	#1, #2,#3	#2	#2	#1	#1
	Standard 4,6	AC synchronous 50/60Hz Rotor voltage: 50/60V Stator voltage: 90V 360x	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	#1, #2,#3	#2	#1	#1	#1
	Standard 20	DC step 35V 180x COM(-) ,3-wire(+)	ON	OFF	OFF	ON	OFF	OFF	ON	ON	-	ON	OFF	#4, #5,#6	#2	–	#2	#2
Yokogawa Navtec (Plaith type)	C-1/1A/2/3 A-55, B-55	AC synchronous 50/60Hz Rotor voltage: 50/60V Stator voltage: 22V 360x	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	#1, #2,#3	#2	#2	#1	#1
	CMZ-700	DC step 24V 180x COM(+),3-wire(-)	ON	OFF	OFF	ON	OFF	OFF	ON	ON	-	ON	OFF	Remo- ve	#2	–	*	*
	CMZ-250X/ 300X/500	DC synchronous 360x	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	-	ON	OFF	Remo- ve	#2	–	*	*
		DC step 35V 180x COM(+),3-wire(-)	ON	OFF	OFF	ON	OFF	OFF	ON	ON	-	ON	OFF	#4, #5,#6	#2	–	#2	#2
	CMZ-100/200/ 300 C-1Jr,D-1Z/1/3 IPS-2/3	AC synchronous 50/60Hz Rotor voltage: 100V Stator voltage: 90V 360x	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	#1, #2,#3	#1	#1	#1	#1
	CMZ-50 Note	step 35V 180x COM(+),3-wire(-)	ON	OFF	OFF	ON	OFF	OFF	ON	ON	–	ON	OFF	Remo- ve	#2	–	*	*
Plaith	NAVGAT II/III	AC synchronous 50/60Hz Rotor voltage: 50/60V Stator voltage: 68V 360x	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	#1, #2,#3	#2	#2	#1	#1
Tokimec (Sperry type)	ES-1/2/11 GLT-101/102/ 103/106K/107	AC synchronous 50/60Hz Rotor voltage: 100/110V Stator voltage: 90V 36x	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	#1, #2,#3	#1	#1	#1	#1
	ES-11A/110 TG-200 PR222R/2000 PR237L/H GM 21	AC synchronous 50/60Hz Rotor voltage: 100/110V Stator voltage: 22V 90x	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	#1, #2,#3	#1	#1	#1	#1
	MK-14 MOD-1/2/T NK-EN,NK-EI	DC step 70V 180x COM(-), 3-wire(+)	ON	OFF	OFF	ON	OFF	OFF	ON	ON	–	OFF	OFF	#4, #5,#6	#2	–	#1	#1
	SR-130/140	DC step 70V 180x 5-wire, open collector	ON	OFF	OFF	OFF	ON	OFF	OFF	OFF	–	OFF	OFF	#4, #5,#6	#2	–	#1	#1
	TG-100/5000 PR-357/130/ 140, ES-17 GLT-201/202 /203	DC step 70V 180x COM(+), 3-wire(-)	ON	OFF	OFF	ON	OFF	OFF	ON	ON	–	OFF	OFF	#4, #5,#6	#2	–	#1	#1
	TG-6000	DC step 24V 180x	ON	OFF	OFF	ON	OFF	OFF	ON	ON	-	ON	OFF	#4, #5,#6	#2	–	#2	#2
	GM-11	AC synchronous 50/60Hz Rotor voltage: 100V Stator voltage: 90V 90x	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	#1, #2,#3	#1	#1	#1	#1
	SR-120,ES-16 MK-10/20/30	DC step 35V 180x	ON	OFF	OFF	ON	OFF	OFF	ON	ON	–	ON	OFF	#4, #5,#6	#2	–	#2	#2
Kawasaki	GX-81	AC synchronous 50/60Hz Rotor voltage: 100/110V Stator voltage: 90V 90x	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	#1, #2,#3	#1	#1	#1	#1
Armabrown	MK-10,MKL-1 SERIES1351, MOD-4	DC step 50V 180x COM(+), 3-wire(-)	ON	OFF	OFF	ON	OFF	OFF	ON	ON	–	OFF	OFF	#4, #5,#6	#2	–	#1	#1
Robertson	SKR-80	DC step 35V 180x COM(-), 3-wire(+)	ON	OFF	OFF	ON	OFF	OFF	ON	ON	–	ON	OFF	#4, #5,#6	#2	–	#2	#2

*: Set JP4 and JP5 according to the voltage of the external power supply.
Note: If CMZ-50 has 35VDC, set JP1 to #4, #5, #6.

Location of DIP switches, jumper wires on the GYRO CONVERTER Board

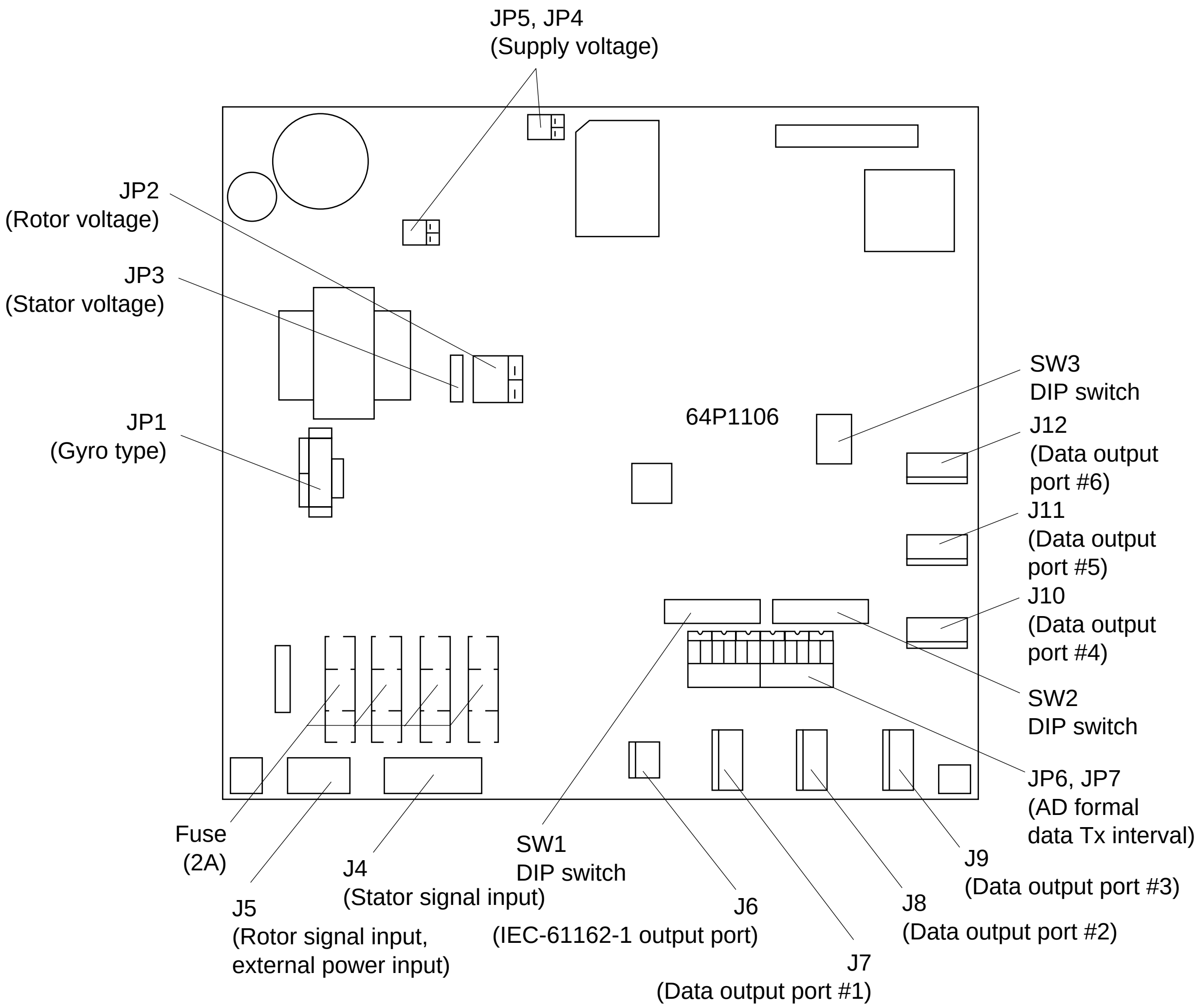


Figure 4-4 GYRO CONVERTER Board

Setting the heading readout on the radar display

Confirm that the gyrocompass is giving a reliable readout. Then, set the heading readout on the radar display with the gyrocompass readout as follows:

1. Press [RADAR MENU] to display the FUNCTIONS 1 menu.
2. Press the [0] key twice to display the FUNCTIONS 3 menu.
3. Press the [9] key to select the GYRO SETTING option.
4. Rotate the EBL control to align the radar’s HDG readout with the gyrocompass.
5. Press [ENTER] to conclude the setting.

4.2 ARP Board ARP-26

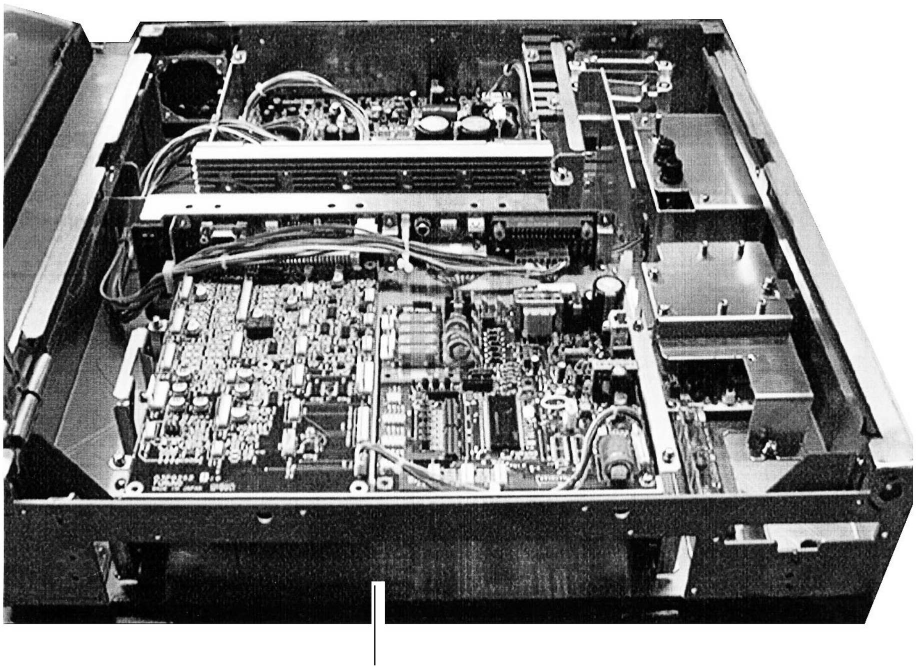
The ARP Board ARP-26, which provides ARPA functions, is an optional circuit board which is accommodated in the display unit of the FR-2105 series radar.

Necessary Parts: ARP-26-2E (008-485-500)

Name	Type	Qty	Code no.
ARP board	18P9002B	1	008-473-650

Installation of the ARP board

1. Remove the bottom cover of the display unit by unfastening four screws.
2. Set the ARP Board in the center slot of the PCB card case.



PCB card case
: RP Board (Option)
: ARP BoardOption)
: SPU Board

Figure 4-5 Display pedestal inside view

3. Adjust the ARP referring to the procedure on the next page.

ARP board adjustment

1. Turn the GAIN, A/C SEA and A/C RAIN controls fully counterclockwise, and then transmit on the 12 nm range.
2. Connect a digital multimeter between TP7(+) and TP6(-) on the ARP Board.

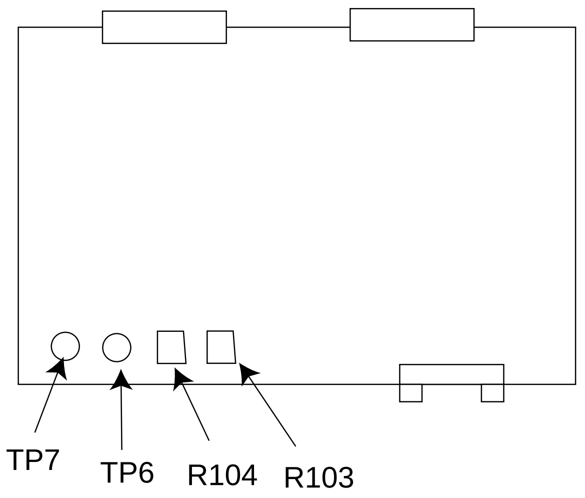


Figure 4-6 ARP Board (18P9002B)

3. Adjust R104 on the ARP Board so the multimeter reads between 0.09 and 0.14 VDC.
4. Set controls and switches as below.

   GAIN: fully clockwise (max.)
   Interference rejector: OFF
   Range: 24 nm
   Echo stretch: OFF

5. Press [RADAR MENU] [0] [0] [0] [0] open the INITIAL SETTING3 menu.
6. Set the VIDEO SIG field to DIGITAL and press [ENTER].
7. Adjust R103 on the ARP Board so noise just appears on the display.

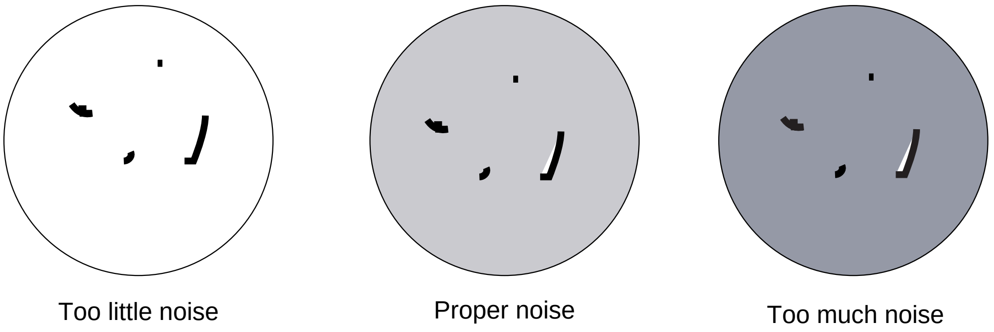


Figure 4-7 How to adjust noise

8. Set VIDEO SIG to ANALOG and press [ENTER].

Final check

Connect a gyrocompass and a log to the radar and place the radar under transmit state. Confirm that LEDs CR9, CR10, CR11, CR12, CR15 and CR16 on the ARP Board are off. If ship's speed is zero, or other signal is not being input, corresponding LED will light.

#4	#3	#2	#1
OFF	OFF	OFF	OFF

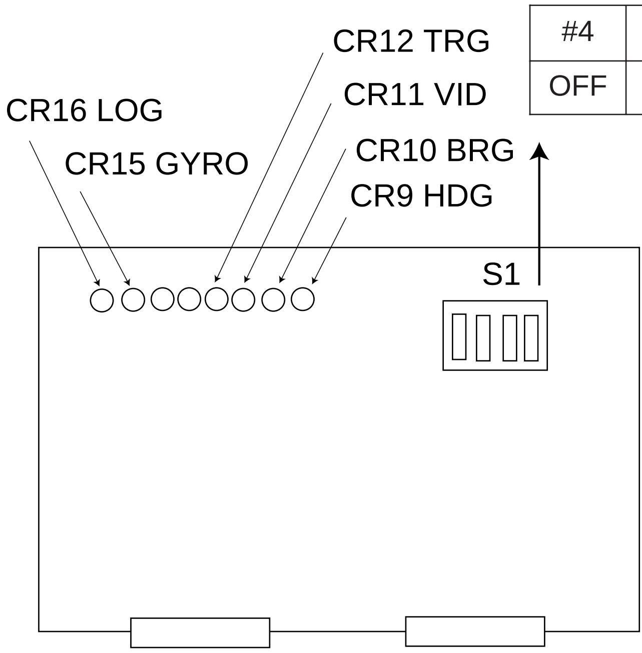


Figure 4-8 ARP Board ARP-26

4.3 RP Board RP-26

The RP Board RP-26, which providesvideo plotter functions, consists of a circuit board and a card drive both of which are accommodated in the display unit of the FR-2105 series radar.

Table top/console type

Necessary Parts: RP-26-T-2E (008-485-520)

Name	Type	Qty	Code no.
RP board	14P0298	1	008-487-640
Card case assy.	–	1	–
Panhead screw B	M4x8 C2700W	4	000-881-445
Panhead screw B	M3x8 C2700W	2	000-881-404
Panhead screw A	M2.6x5 C2700W	2	000-800-973
Teethed lock washer (Outside teeth)	M4 C5191W	1	000-864-506
Cable assy.	HIF6-100D-A-A-52	1	000-137-553

1. Lift the monitor and fix it with the stay. Refer to Chapter 1 for instructions.
2. Remove the right arm cover from the control head.
3. Fasten the card case to the right arm cover as follows:
   a) Fasten the ground wire with an M4x10 screw and washer (supplied) as shown below.
   b) Fasten the arm cover to the card case with three M4x8 screws (supplied).

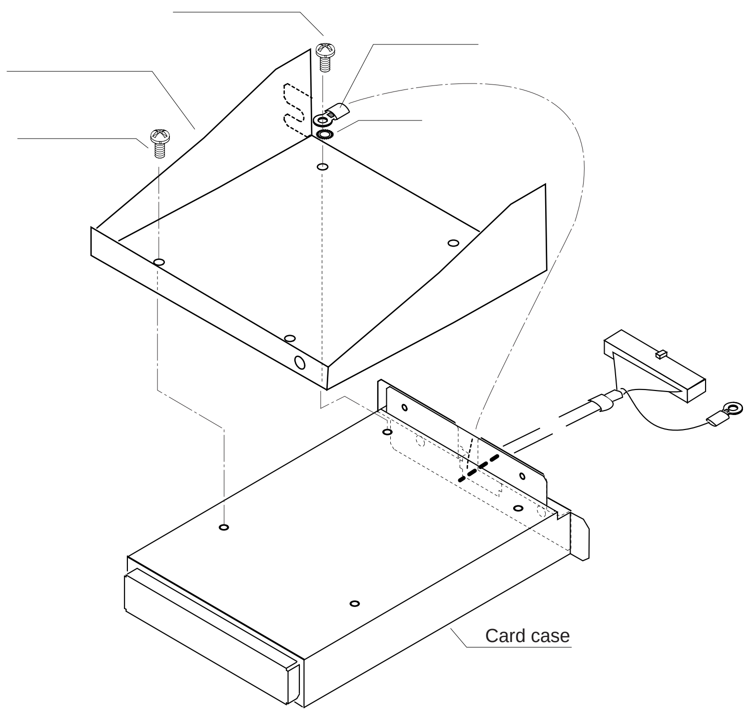


Figure 4-9 Fastening the card case to the right arm cover

4. Unfasten the front panel from the display pedestal.
5. Pass the connector from the card case through the hole in the display pedestal.

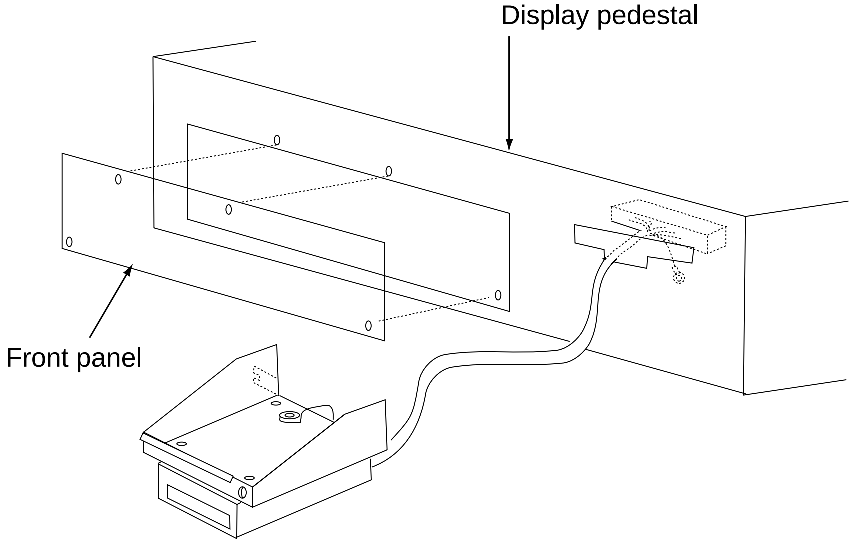


Figure 4-10 Display pedestal

6. Set the RP Board (14P0298) in the top slot of the pcb card case. See page 4-7 for the location of the pcb card case.
7. Run the connector from the card case in front of the GYRO CONVERTER Board.
8. Plug the connector in J1 on the RP Board.
9. Fasten the ground wire from the connector at the location shown below.

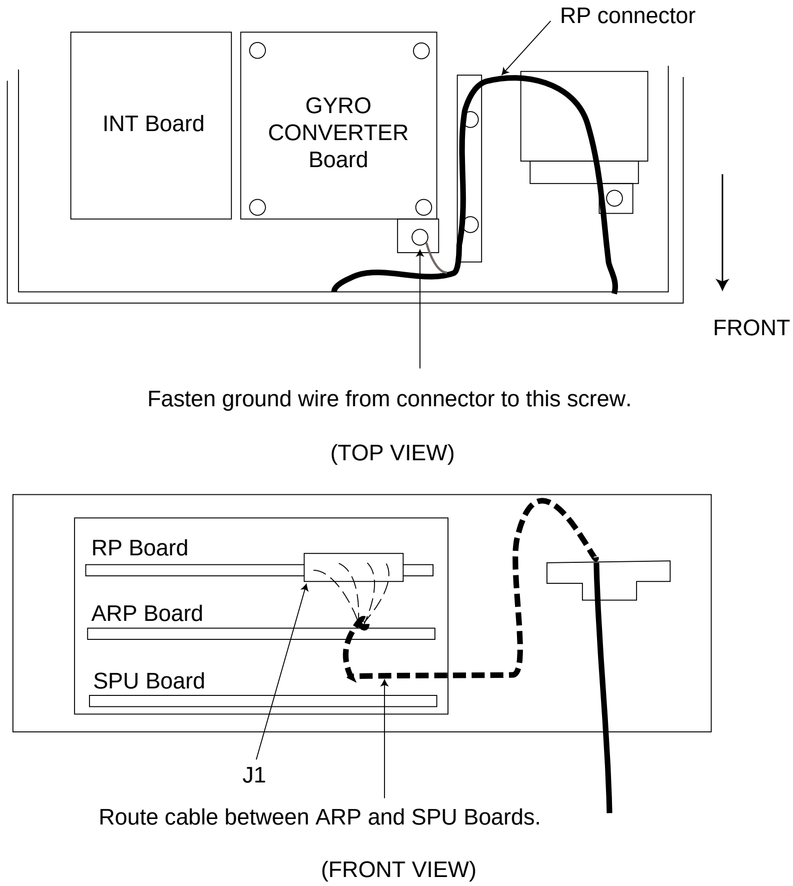


Figure 4-11 Display pedestal, top view

10. Fasten the front panel on the display pedestal.
11. Retract the stay to close the display unit.
12. Fasten the right arm cover.

Separate type control head

Necessary parts: RP-26-Z-2E (Code no. 008-491-400)

Name	Type	Qty	Code No.
Card Case Assy.	–	1	–
RP Board	14P0298	1	008-487-640
Pan Head Screw B	M4x8 C2700W	1	000-881-445
Pan Head Screw B	M3x8 C2700W	2	000-881-404
Pan Head Screw A	M2.6x5 C2700W	2	000-800-973

1. Lift the monitor. See Chapter 1 for instructions.
2. Fasten the mounting base with one M4 x 8 screw as below.

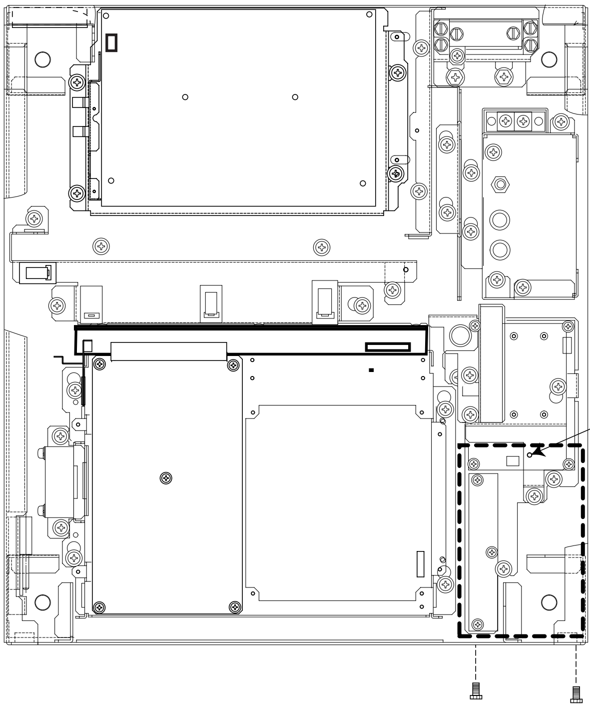


Figure 4-12 Display unit, inside view

3. Fix the mounting base to front panel with two M3 x 8 screws.
4. Set the M-card case lid to the hole in the front panel and fix with two M2.6 x 5 screws.

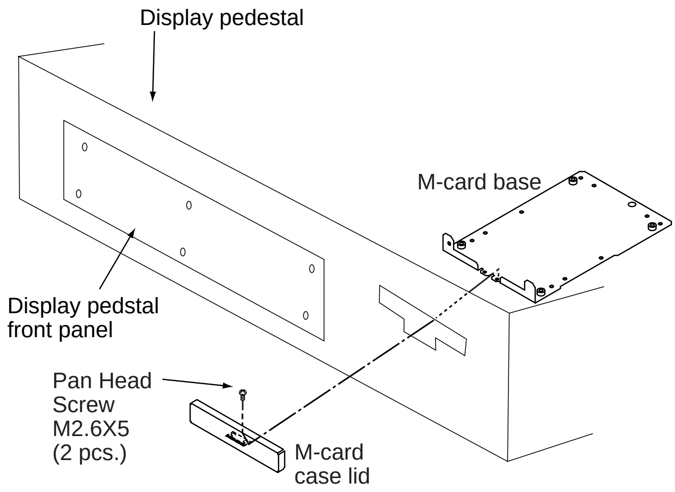


Figure 4-13 Display pedestal, front view

5. Loosen six screws to remove the front panel on the display pedestal.
6. Set the RP Board (14P0298) in the top slot of the pcb card case.
7. Run the connector from the card case in front of the GYRO CONVERTER Board.
8. Plug the connector in J1 on the RP Board.
9. Fasten the ground wire from the connector at the location shown below.

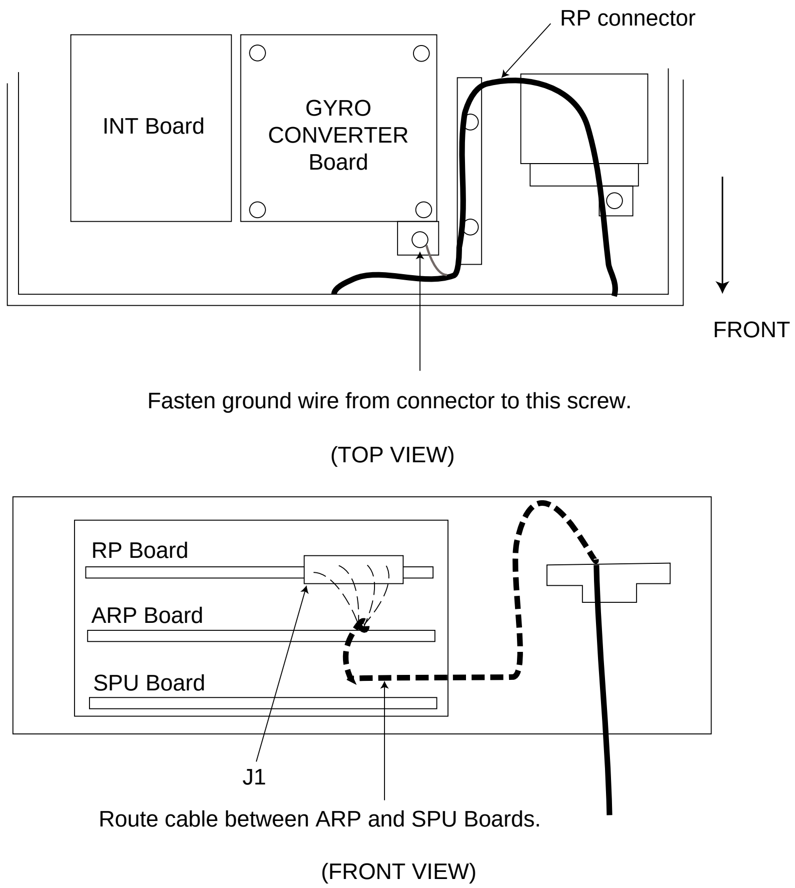


Figure 4-14 Display pedestal, top view

10.Fasten the front panel of the display pedestal.

11.Fasten the ground wire to the location shown in Figure 4-14.

12.Close the monitor.

4.4 Performance Monitor PM-50

Necessary parts: PM-50 and OP03-150 (Code no. 008-485-490)

Name	Type	Qty	Code No.
PM Board	03P9225	1	
Pan Head Screw	M3x8 C2700W	3	000-881-404
Connector Assy.	VH3P-L300-AA	2	000-141-014

1. Lift the monitor. See Chapter 1 for instructions.
2. Fasten the PM Board 03P9225 to the location shown below with three screws (M3 x 8).

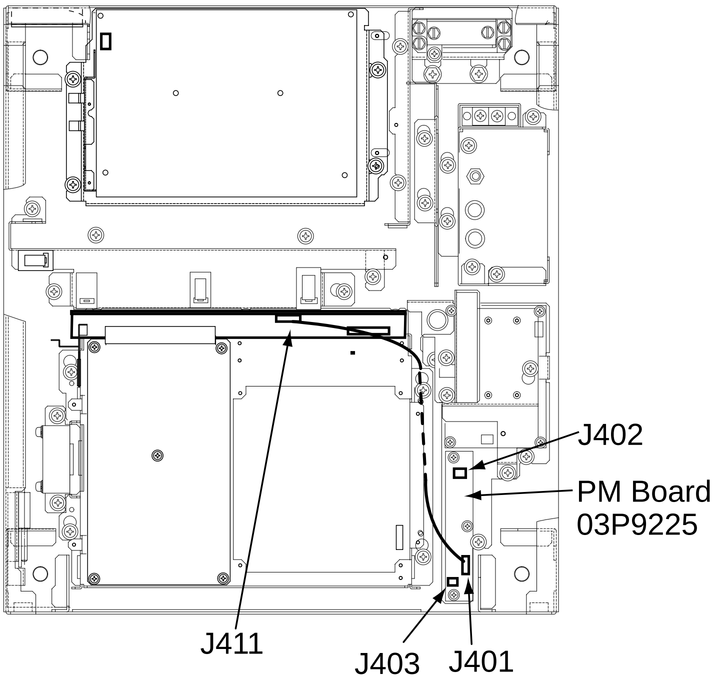


Figure 4-15 Display unit, inside view

3. Connect the connector P401 coming from J411 to J401 on the PM Board.
4. Connect two connector assemblies (VH3P-L300-AA) to J402 and J403.
5. Solder the other end of there connector assemblies with external cables, one from ship’s mains and one from the PM-30.
6. Peel off the seal located to the right of the antenna switch in the tuning compartment on the control head to access PM switch. (Refer to page 1-14 for location.)
7. Close the monitor.

4.5 Alarm Kit

Necessary parts: OP03-156 (Code no. 008-500-650)

The alarm kit mainly consists of a circuit board and connection cables, and provides alarm output to ship's bridge alarm system.

Contents of Alarm Kit OP03-156

Name	Type	Code No.	Qty
ALARM Board	03P9262	008-500-680	1
NH Connector Assy.	03-1990(9-9P)	008-500-700	1
NH Connector Assy.	03-1991(3P)	008-500-710	4
Cable Band	HP-3N	000-570-001	1
Cable Tie	CV-100	000-570-322	3
Pan-head Screw B	M3X8 C2700W	000-881-404	4
Pan-head Screw B	M4X12 C2700W	000-881-447	1

Procedure

Refer to the figure below for parts locations.

1. Raise the monitor and fix it with the stay. (See page 1-5 for instructions.)
2. Unfasten four screws to dismount the shield cover for the INT Board.
3. Fasten the ALARM Board to the display unit with four pan-head screws (M3X8, supplied).
4. Connect the NH connector (9-9P, supplied) between J471 on the ALARM Board and J451 (EXT-BUZ) on the INT Board, passing it through the cable band and binding it with existing cable tie.
5. Fasten the cable band (supplied) with a pan-head screw (M4X12, supplied) and attach two cable ties (CV-100, supplied).
6. Connect an NH connector (3P, supplied) to each of J472, J473, J474 and J475 on the ALARM Board.
7. Route the NH connectors along the cables ties and pass them through the cable clamp. Fasten the shield cover removed at step 1.
8. Close the INT board cover.
9. Close the monitor.
10. Connect NH connectors to ship's bridge alarm system:

    J472: ARPA guard zone; target alarm
    J473: SYSTEM FAILURE (HP, BP, TRIG, VIDEO, GYRO, AZI)
    J474: ARPA CPA/TCPA
    J475: Spare

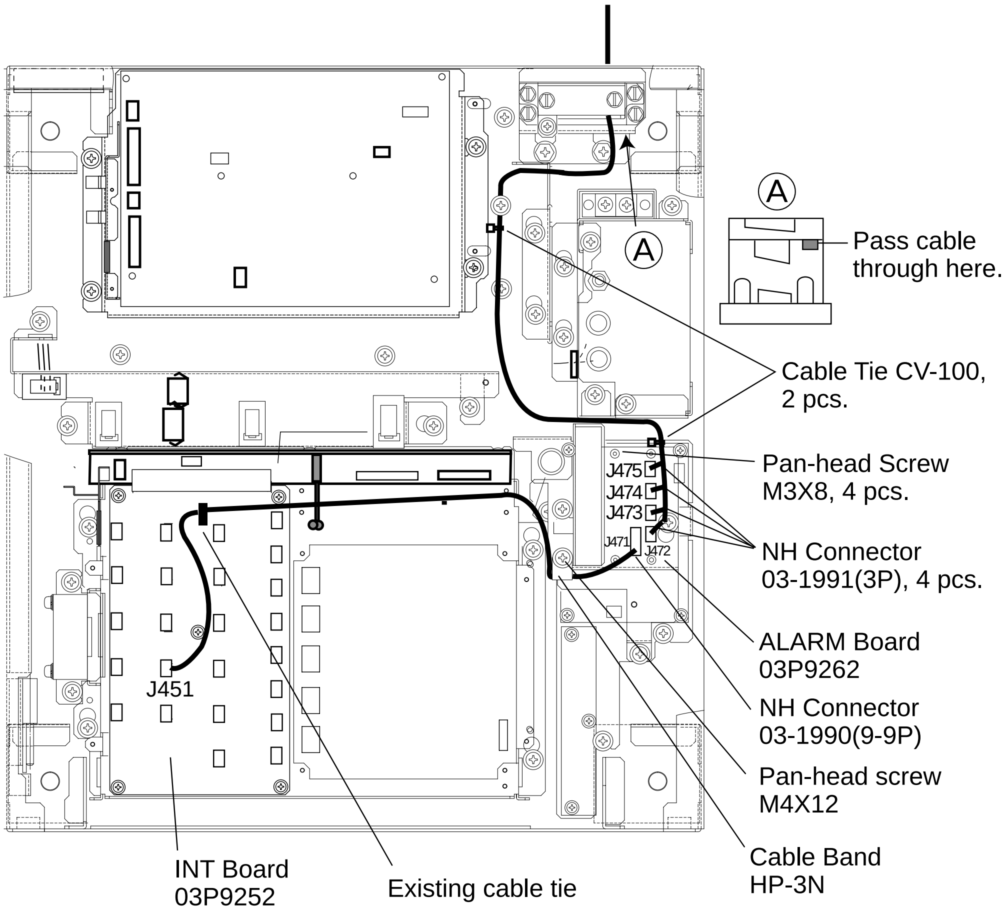
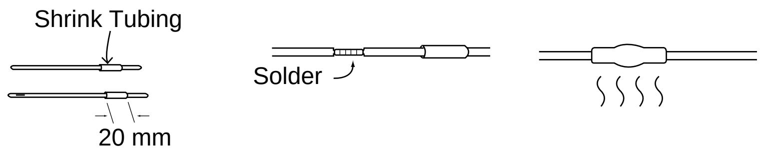


Figure 4-16 Display unit, inside view

HOW TO INSULATE THE POWER CABLE



① Make length of shrink tubing 20 mm; slip tubing onto wiring.

② Solder power cable to signal cable.

③ Heat shrink tubing with soldering iron.

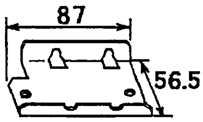
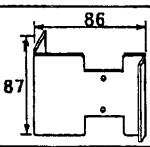
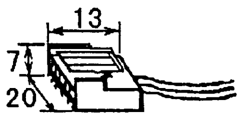
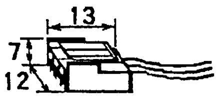
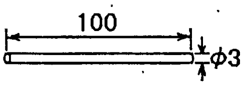
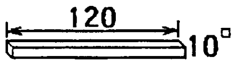
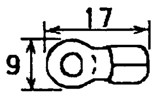
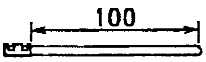
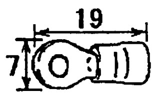
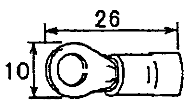
FURUNO

CODE NO.	008-503-450	03FS-X-9408 -2
TYPE	CP03-19105	1/2

工事材料表

INSTALLATION MATERIALS

FR-2115/2115-B 船舶用レーダ
FR-2125/2125V
FR-2125W/2125-B
FR-2135S/2135SW
FR-2135S-B/2165DS MARINE RADAR
FR-2155/2155-B

番号 NO.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS		数量 Q'TY	用途／備考 REMARKS
1	下クランプ前板 LOWER CLAMP FRONT PLATE		03-144-1425-1		1	
			CODE NO.	100-263-601		
2	下クランプ後板 LOWER CLAMP REAR PLATE		03-144-1426-0		1	
			CODE NO.	100-263-610		
3	VHコネクタ組品 VH CONNECTOR ASSY.		03-1737(5P)		1	
			CODE NO.	008-454-380		
4	VHコネクタ組品 VH CONNECTOR ASSY.		03-1738(3P)		1	
			CODE NO.	008-454-390		
5	スミチューブF(Z) HEAT-SHRINK TUBE		3X0.25 クロ *0.10M*		2	
			CODE NO.	000-105-874		
6	シールドフォーム SHIELD FOAM		71TS-10-10*0.12M*		4	
			CODE NO.	000-808-456		
7	圧着端子 CRIMP-ON LUG		8NK4		2	
			CODE NO.	000-538-180		
8	NHコネクタ *センサイ* NH CONNECTOR ASSY.		AWG24 *0.1M*		20	
			CODE NO.	000-132-342		
9	圧着端子 CRIMP-ON LUG		FV1.25-M3 アカ		5	
			CODE NO.	000-538-110		
10	圧着端子 CRIMP-ON LUG		FV5.5-4		2	
			CODE NO.	000-538-123		

DWG NO.
C3464-M01- F

FURUNO ELECTRIC CO., LTD.

(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

FURUNO

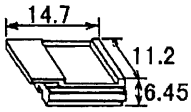
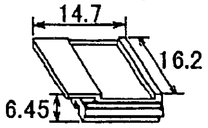
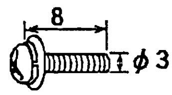
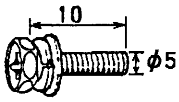
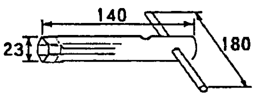
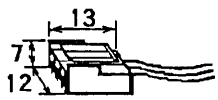
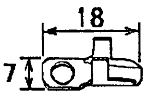
CODE NO.	008-503-450	03FS-X-9408 -2
TYPE	CP03-19105	2/2

工事材料表

INSTALLATION MATERIALS

FR-2115/2115-B
FR-2125/2125V
FR-2125W/2125-B
FR-2135S/2135SW
FR-2135S-B/2165DS
FR-2155/2155-B

船舶用レーダ
MARINE RADAR

番号 NO.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	用途／備考 REMARKS
11	ｺﾈｸﾀ CONNECTOR		H3P-SHF-AA CODE NO. 000-505-596	2	
12	ｺﾈｸﾀ CONNECTOR		H5P-SHF-AA CODE NO. 000-505-598	2	
13	+-ﾅﾍﾞ ｾﾑｽﾈｼﾞ B WASHER HEAD SCREW		M3X8 C2700 MBNI2 CODE NO. 000-881-404	2	
14	+ｱﾌﾟ ｾｯﾄUIｾﾑｽB +HEX.BOLT (WASHER HEAD)		M5X10 SUS304 CODE NO. 000-802-288	2	
15	ﾊﾟｲﾌﾟﾎﾞｯｸｽPS PIPE BOX SPANNER		PS0017 CODE NO. 000-830-140	1	
16	ｺﾈｸﾀ(ｸﾐﾋﾝ) CONNECTOR ASSY.		VH3P-L300-AA CODE NO. 000-141-014	2	
17	特殊ラグ LUG		ｱﾅｹｲ4 ｽｽﾞ CODE NO. 000-536-100	2	

DWG NO.
C3464-M02- F

FURUNO ELECTRIC CO ., LTD.

(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

FURUNO

CODE NO.	008-452-540	03EP-X-9405 -4
TYPE	CP03-13907	1/1

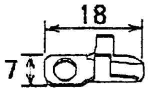
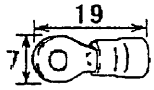
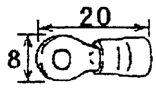
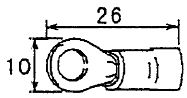
工事材料表

INSTALLATION MATERIALS

FR/FAR-2125W
FR-2135S/-B
FR-2135SW/-MSA
FR-2155/-B/2165DS
FR/FAR-2825W
FR/FAR-2835S/SW
FR/FAR-2855/W
FR/FAR-2865SW

船舶用レーダー

MARINE RADAR

番号 NO.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS		数量 Q'TY	用途／備考 REMARKS
1	特殊ラグ LUG		アナケイ4　スズ CODE NO.	 000-536-100	2	
2	圧着端子 CRIMP-ON LUG		FV1.25-M3 アカ CODE NO.	 000-538-110	16	
3	圧着端子 CRIMP-ON LUG		FV1.25-4 CODE NO.	 000-538-114	11	
4	圧着端子 CRIMP-ON LUG		FV5.5-4 CODE NO.	 000-538-123	19	

DWG NO.
C3387-M01- E

FURUNO ELECTRIC CO., LTD

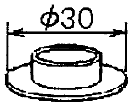
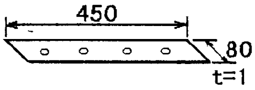
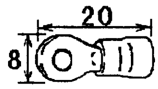
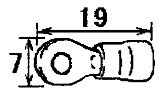
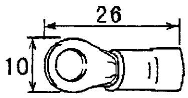
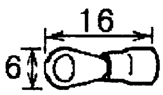
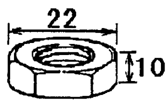
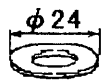
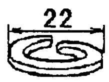
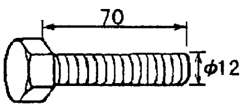
（略図の寸法は、参考値です。　DIMENSIONS IN DRAWING FOR REFERENCE ONLY.）

FURUNO

CODE NO.	008-421-560	03EP-X-9431 -3
TYPE	CP03-14603	1/2

工事材料表

INSTALLATION MATERIALS

番号 NO.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	用途／備考 REMARKS
1	ｼｰﾙﾜｯｼｬ SEAL WASHER		03-001-3002-0 CODE NO. 300-130-020	8	
2	防蝕ゴム CORROSION-PROOF RUBBER MAT		03-029-0301-2 CODE NO. 100-091-112	2	
3	圧着端子 CRIMP-ON LUG		FV1.25-4 CODE NO. 000-538-114	18	
4	圧着端子 CRIMP-ON LUG		FV1.25-M3 ｱｶ CODE NO. 000-538-110	26	
5	圧着端子 CRIMP-ON LUG		FV5.5-4 CODE NO. 000-538-123	2	
6	圧着端子 CRIMP-ON LUG		FVD1.25-3 CODE NO. 000-116-634	1	
7	六角ﾅｯﾄ 1種 HEX.NUT		M12 SUS304 CODE NO. 000-863-112	16	
8	ﾐｶﾞｷ平座金 FLAT WASHER		M12 SUS304 CODE NO. 000-864-132	8	
9	ﾊﾞﾈ座金 SPRING WASHER		M12 SUS304 CODE NO. 000-864-263	8	
10	六角ﾎﾞﾙﾄ (全ﾈｼﾞ) HEX.BOLT		M12X70 SUS304 CODE NO. 000-807-825	8	

DWG NO. C3387-M07- D

FURUNO ELECTRIC CO.,LTD.

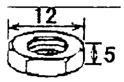
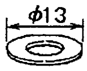
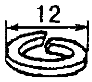
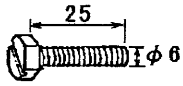
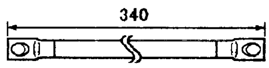
(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

FURUNO

CODE NO.	008-421-560	03EP-X-9431 -3
TYPE	CP03-14603	2/2

工事材料表

INSTALLATION MATERIALS

番号 NO.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	用途／備考 REMARKS
11	六角ﾅｯﾄ 1種 HEX. NUT		M6 SUS304 CODE NO. 000-863-109	1	
12	ﾐｶﾞｷ平座金 FLAT WASHER		M6 SUS304 CODE NO. 000-864-129	3	
13	ﾊﾞﾈ座金 SPRING WASHER		M6 SUS304 CODE NO. 000-864-260	1	
14	六角ﾎﾞﾙﾄ HEX. BOLT		M6X25 SUS304 CODE NO. 000-862-180	1	
15	ｱｰｽ線 GROUNDING WIRE		RW-4747-1 03S4747 CODE NO. 000-566-000	1	

DWG NO. C3387-M08- D

FURUNO ELECTRIC CO ., LTD.

（略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.）

FURUNO

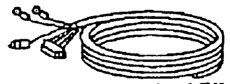
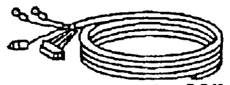
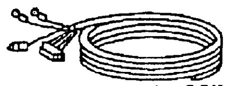
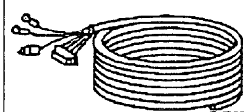
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TYPE		1/1

工事材料表

INSTALLATION MATERIALS

FR-2135S/2135S-B 船舶用ﾚｰﾀﾞｰ

MARINE RADAR

番号 NO.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS		数量 Q'TY	用途／備考 REMARKS
1	信号ｹｰﾌﾞﾙ組品 SIGNAL CABLE ASSY.	 L=15M	S03-74-15		1	選択 TO BE SELECTED
			CODE NO.	008-485-430		
2	信号ｹｰﾌﾞﾙ組品 SIGNAL CABLE ASSY.	 L=20M	S03-74-20		1	選択 TO BE SELECTED
			CODE NO.	008-485-440		
3	信号ｹｰﾌﾞﾙ組品 SIGNAL CABLE ASSY.	 L=30M	S03-74-30		1	選択 TO BE SELECTED
			CODE NO.	008-485-450		
4	信号ｹｰﾌﾞﾙ組品 SIGNAL CABLE ASSY.	 L=60M	S03-74-60		1	選択 TO BE SELECTED
			CODE NO.	008-491-280		

DWG NO.
C3469-M01- B

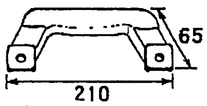
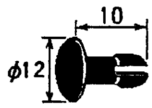
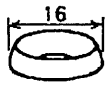
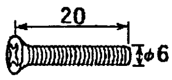
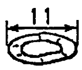
FURUNO ELECTRIC CO., LTD

(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

FURUNO

CODE NO.	008-478-830	03FS-X-9501 -5
TYPE	FP03-06201	1/1

付属品表
ACCESSORIES

番号 NO.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	用途／備考 REMARKS
1	取手 HANDLE		14-002-1125-2 CODE NO. 840-211-252	2	
2	ｽﾅｯﾌﾟﾎﾞﾀﾝ PLASTIC RIVET		KB-13ﾖｳ ﾎﾞﾀﾝｸﾛ CODE NO. 000-570-276	4	
3	ﾛｰｾﾞｯﾄ座金 ROSETTE WASHER		M6 C2700W ﾎﾟﾘｼｰﾙ ｸﾛ CODE NO. 000-864-910	4	
4	+丸皿小ﾈｼﾞ OVAL COUNTERSUNK HEAD SCREW		M6X20 C2700W ﾎﾟﾘｼｰﾙ ｸﾛ CODE NO. 000-861-475	4	
5	波座金 WAVE WASHER		WW-6 SUS CODE NO. 000-864-350	4	

DWG NO. C3464-F01- F

FURUNO ELECTRIC CO ., LTD.

(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

FURUNO

CODE NO.	008-490-970	03FS-X-9502 -4
TYPE	FP03-06503	1/1

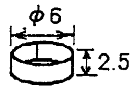
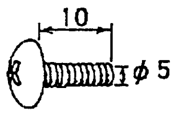
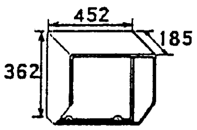
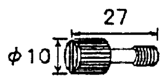
付属品表

ACCESSORIES

FR-2115/2115-B
FR-2125/2125W
FR-2125-B
FR-2155/2155-B
FR-2135S/2135SW
FR-2135S-B/2165DS
GD-680/GP-680

船舶用ﾚｰﾀﾞ
ｶﾗｰﾋﾞﾃﾞｵﾌﾟﾛｯﾀ
ｶﾗｰGPSﾌﾟﾛｯﾀ

MARINE RADAR
COLOR VIDEO PLOTTER
COLOR GPS PLOTTER

番号 NO.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	用途／備考 REMARKS
1	ﾏｷｽﾍﾟｰｻｰ SPACER		5X2.5 CODE NO. 000-808-429	2	
2	+ﾄﾗｽﾈｼﾞ SCREW		M5X10 C2700W CODE NO. 000-808-430	2	
3	ﾌｰﾄﾞ HOOD		03-144-1335-1 CODE NO. 100-263-331	1	
4	ﾌｰﾄﾞﾋﾞｽ HOOD RETAINER		03-144-1336-1 CODE NO. 100-266-311	2	

DWG NO. C3464-F02- E

FURUNO ELECTRIC CO., LTD

(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

CODE NO.	008-485-480	03FS-X-9504 -5
TYPE	FP03-06502	1/1

付属品表 ACCESSORIES	FR-2115/2115-B FR-2125/2125-B FR-2155/2155-B FR-2135S/2135S-B FR-2135SW/2125V FR-2165DS	船舶用レーダ MARINE RADAR

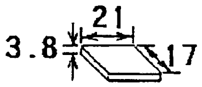
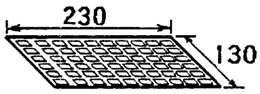
番号 NO.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	用途／備考 REMARKS
1	ﾕｰｻﾞｰｷｰｷｬｯﾌﾟ USER KEYCAP		03-144-1613-1 CODE NO. 100-263-831	4	
2	ﾕｰｻﾞｰｷｰｼｰﾄ(E) USER KEYSHEET(E)		03-144-1655-1 CODE NO. 100-263-881	1	

Figure text for image 1:

Figure text for image 2:

DWG NO. C3464-F04- E

FURUNO ELECTRIC CO., LTD

（略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.）

FURUNO

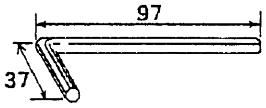
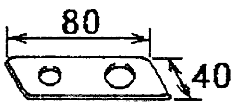
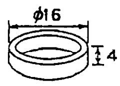
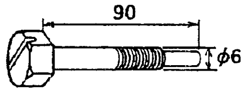
CODE NO.	008-254-170	03CQ-X-9501 -6
TYPE	FP03-02710	1/1

付属品表

ACCESSORIES

FR-2135S/2135SW
FR-2135S-B
FR/FAR-2835S
FR/FAR-2835SW
FR/FAR-2865SW
FR-2135SW-MSA

船舶用レーダー
MARINE RADAR

番号 NO.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS		数量 Q'TY	用途／備考 REMARKS
1	六角レンチ HEX. WRENCH		対辺6		1	
			CODE NO.	000-830-134		
2	つり上げ金具 LIFTING FIXTURE		03-015-3233-0		2	
			CODE NO.	100-090-720		
3	取付用カラー COLLAR FOR LIFTING FIXTURE		03-015-3234-0		2	
			CODE NO.	100-090-730		
4	ボルト BOLT		03-029-0403-0		1	
			CODE NO.	100-091-140		

DWG NO. C3407-F01- F

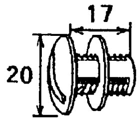
FURUNO ELECTRIC CO ., LTD

（略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.）

FURUNO

CODE NO.	008-493-240	03FS-X-9505 -0
TYPE	FP03-06504	1/1

付属品表 ACCESSORIES	FR-2115/2125/2125W/2135S/2135SW/2155/2165DS 船舶用レーダー MARINE RADAR	

番号 NO.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	用途／備考 REMARKS
1	ﾎﾞﾙﾄｷｬｯﾌﾟ COSMETIC CAP		CP-30-BC-10 CODE NO. 000-808-408	4	

DWG NO. C3464-F05- A

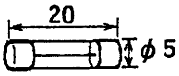
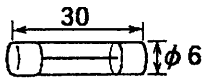
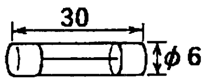
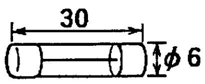
FURUNO ELECTRIC CO ., LTD

(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

FURUNO

CODE NO.	008-503-460	03FS-X-9303 -5
TYPE	SP03-12506	BOX NO. P

SHIP NO.	SPARE PARTS LIST FOR		U S E	SETS PER VESSEL
	FR-2115/2115-B ~~FR-2115-B~~ FR-2125/2125V FR-2125W/2125-B FR-2155/2155-B FR-2135S/2135SW FR-2135S-B/2165DS	船舶用レーダ MARINE RADAR	指示部 FOR DISPLAY UNIT	

ITEM NO.	NAME OF PART	OUTLINE	DWG. NO. OR TYPE NO.	QUANTITY WORKING PER SET	QUANTITY WORKING PER VES	SPARE	REMARKS/CODE NO.
1	ヒューズ FUSE		FGMB 2A 250V	4		8	000-122-000
2	ヒューズ FUSE		FGBO 0.5A AC250V	3		6	000-549-018
3	ヒューズ FUSE		FGBO 5A AC250V	2		4	000-549-022
4	ヒューズ FUSE		FGBO 10A AC125V	2		4	000-549-065

MFR'S NAME	FURUNO ELECTRIC CO., LTD.	DWG NO.		1/1

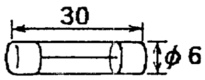
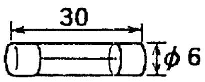
(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

DWG NO.
C3464-P03- D

FURUNO

CODE NO.	008-452-700	03EP-X-9301 -3
TYPE	SP03-10320	BOX NO. P

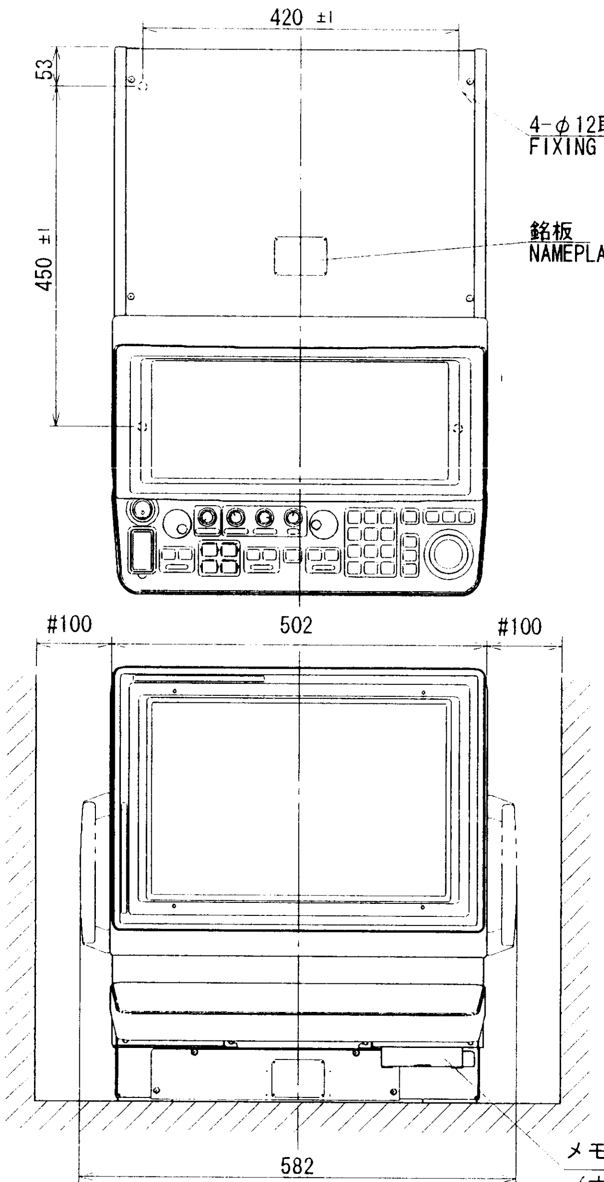
SHIP NO.	SPARE PARTS LIST FOR	U S E	SETS PER VESSEL
	FR-2155/2155-B 船舶用レーダー FR-2125W/2165DS FR-2135S/2135SW FR-2135S-B/2825W FR-2855/2855W MARINE RADAR FR-2865SW FR-2835S/2835SW	電源制御部用 FOR POWER CONTROL UNIT	

ITEM NO.	NAME OF PART	OUTLINE	DWG. NO. OR TYPE NO.	QUANTITY WORKING PER SET	QUANTITY WORKING PER VES	SPARE	REMARKS/CODE NO.
1	ヒューズ FUSE	 	FGBO-A 2A AC125V	1		2	000-549-062
2	ヒューズ FUSE	 	FGBO 10A AC125V	2		4	000-549-065

MFR'S NAME	FURUNO ELECTRIC CO.,LTD	DWG NO.	C3387-P01- D	1/1

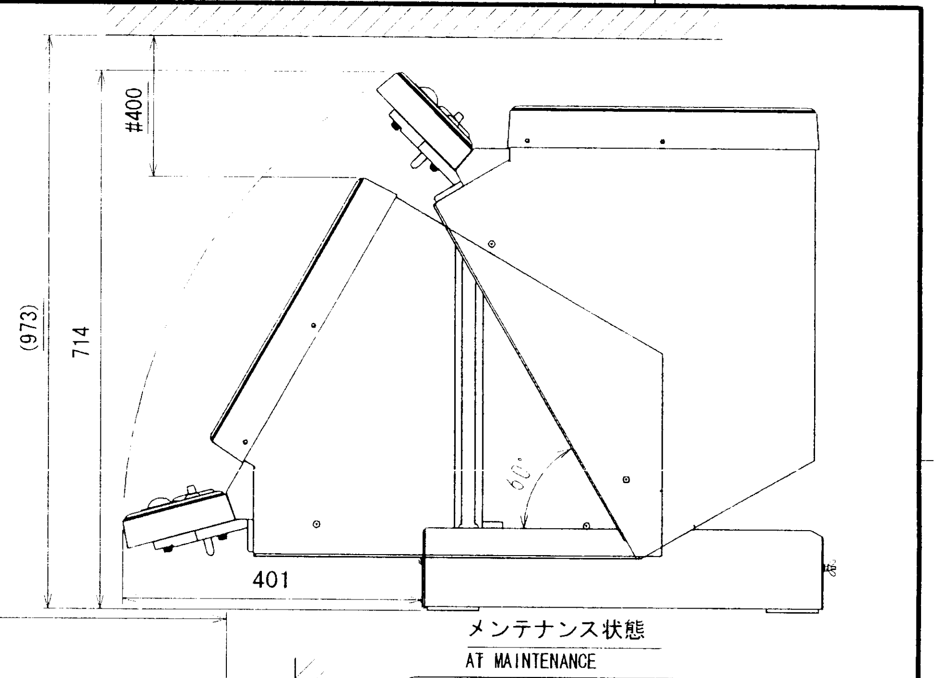
(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

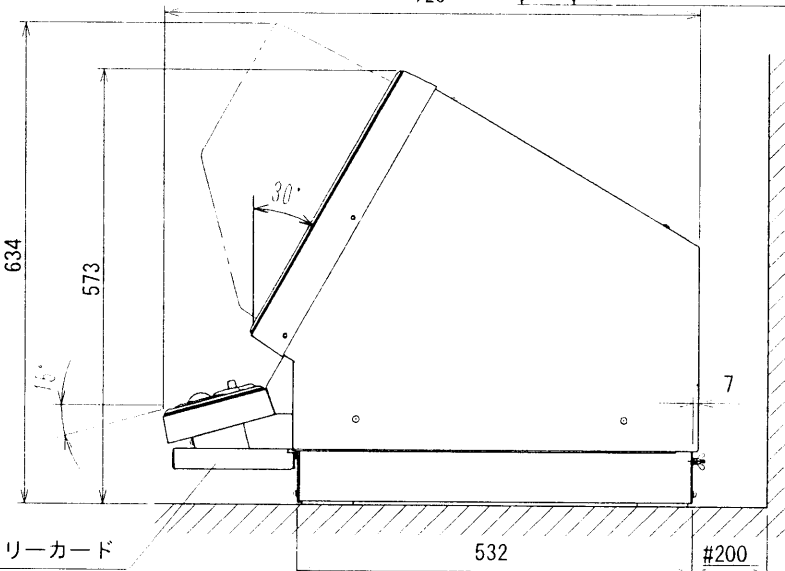
FURUNO

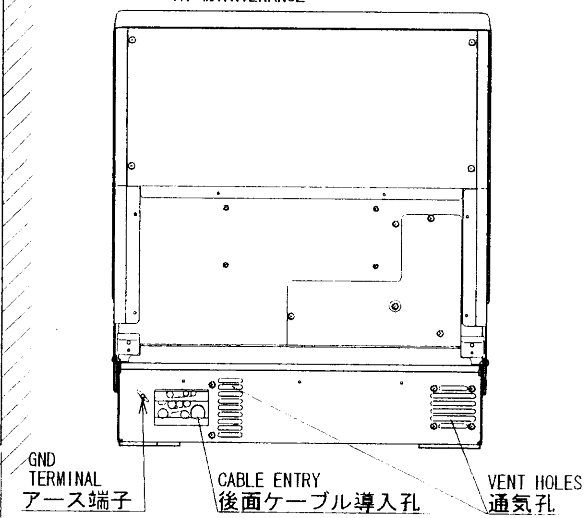


寸法区分(mm) DIMENSION	公差(mm) TOL.
L≦50	±1．5
50＜L≦100	±2．5
100＜L≦500	±3
500＜L≦1000	±4

表1 TABLE 1







注 記 1） #印寸法は最小サービス空間寸法とする。

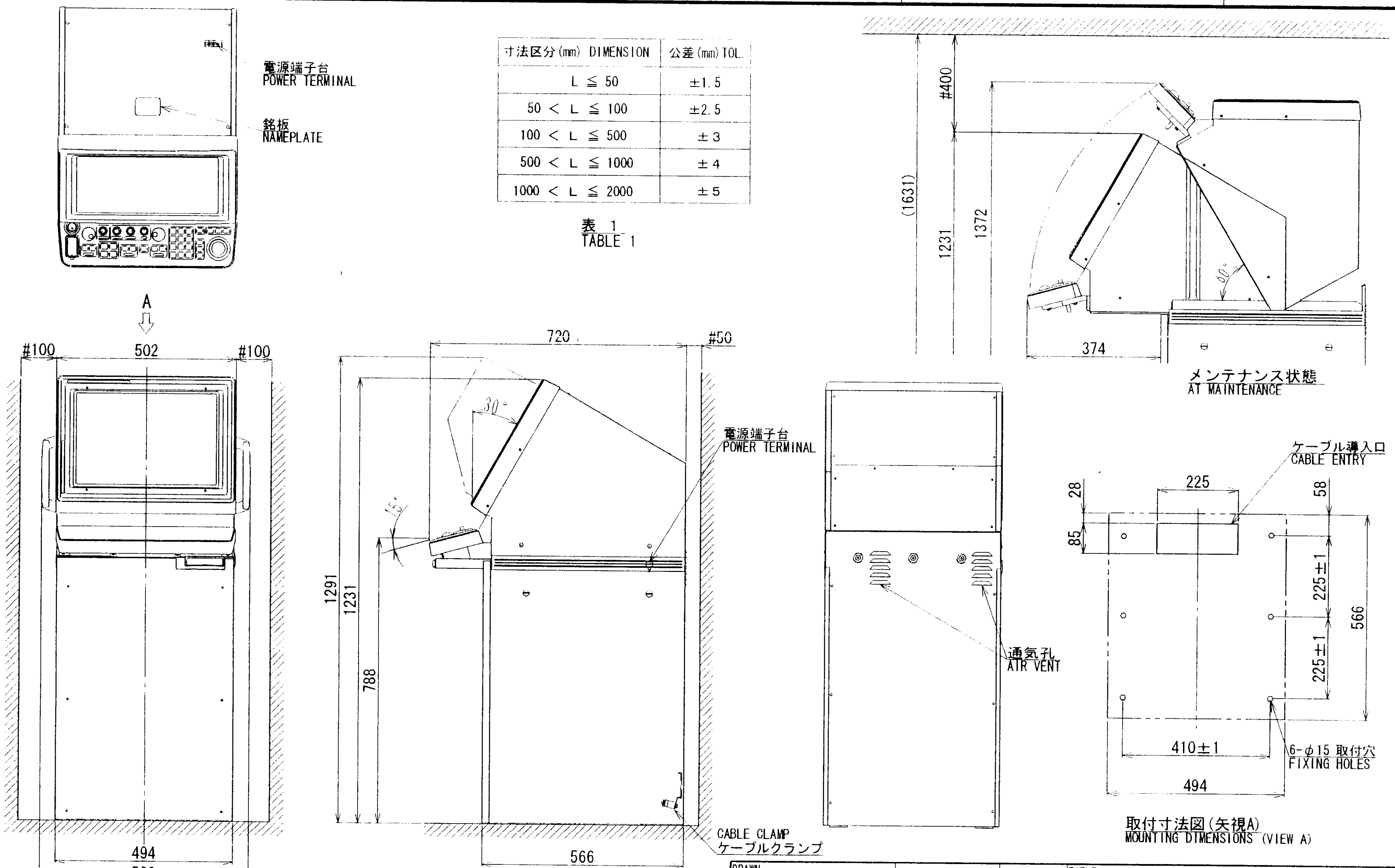
2） 指定外の寸法公差は、表1による。

NOTE 1. #: RECOMMENDED SERVICE CLEARANCE.

2. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS.

DRAWN July 19 '00 T. YAMASAKI		TITLE	RDP-124
CHECKED July 19 '00 Y. Kim	OTHERS FR-2125 FR-2115	名称	指示部
APPROVED July 19 '00 Y. Kim			外寸図
SCALE 1/10	MASS 61 kg ±10%	NAME	DISPLAY UNIT
DWG No C3464-G01- C	03-144-1010-G3		OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.



寸法区分(mm) DIMENSION	公差(mm) TOL.
L ≦ 50	±1.5
50 ＜ L ≦ 100	±2.5
100 ＜ L ≦ 500	±3
500 ＜ L ≦ 1000	±4
1000 ＜ L ≦ 2000	±5

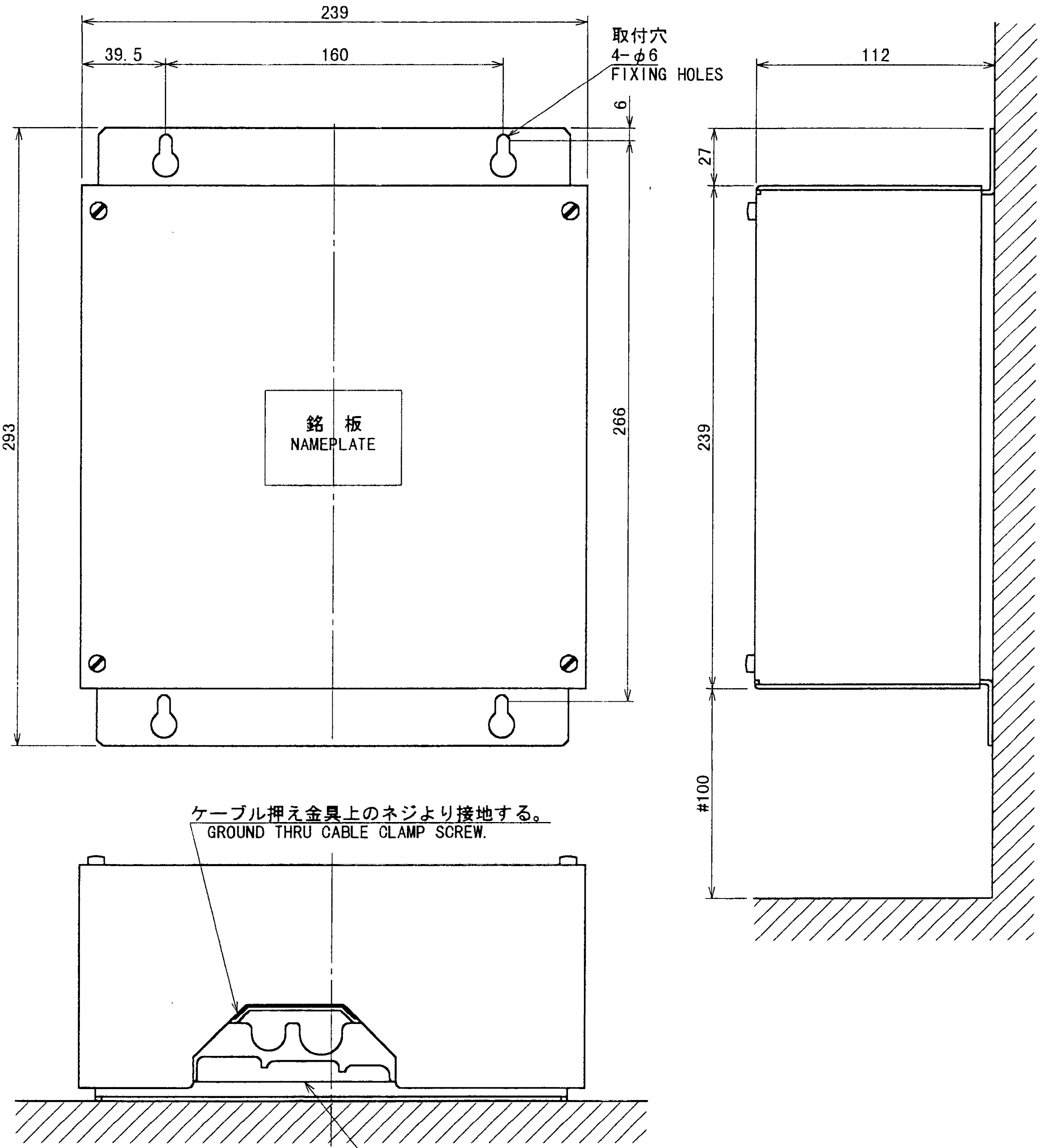
表 1
TABLE 1

注記 1） #印寸法は最小サービス空間寸法とする。
2） 指定外の寸法公差は、表1による。

NOTE 1. #: RECOMMENDED SERVICE CLEARANCE.
2. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS.

DRAWN July 19 '00 T.YAMASAKI		TITLE	RDP-124
CHECKED July 19 '00 Y.K	OTHERS	名称	指示部（コンソール型）
APPROVED July 19 '00 Y.K	FR-2125 FR-2115		外寸図
SCALE 1/15	MASS 100 kg ±10%	NAME	DISPLAY UNIT (CONSOLE TYPE)
DWG. No. C3464-G03- D	03-144-1800-G6		OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.



注記

1）指定なき寸法公差は表１による。
2）#：推奨する最小サービス空間寸法。
3）取付ネジはトラスタッピンネジ呼び径５×20を使用のこと。

NOTE

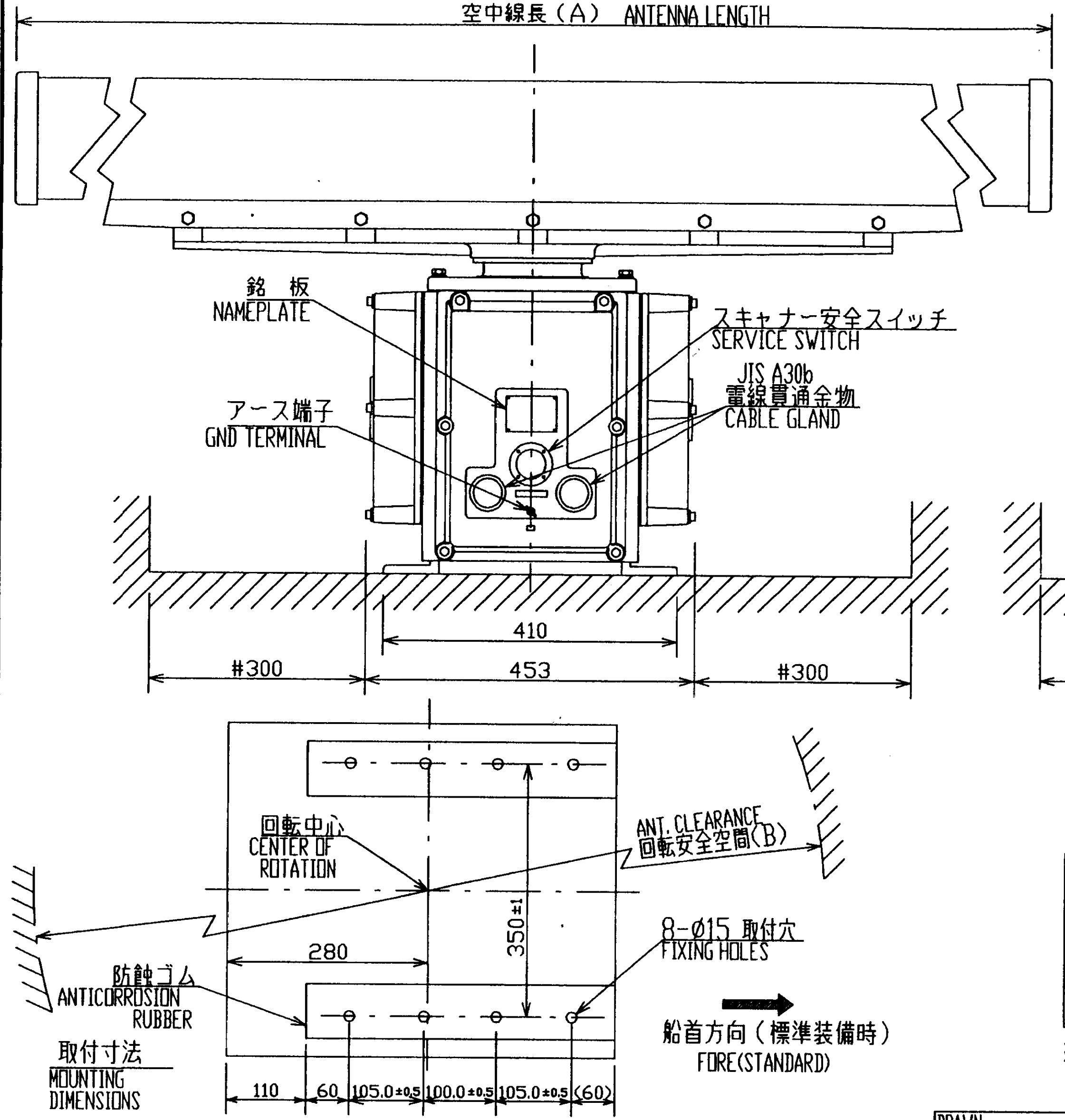
1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS.
2. #: RECOMMENDED SERVICE CLEARANCE.
3. USE TAPPING SCREWS 5x20 FOR FIXING THE UNIT.

表１ TABLE 1

寸法区分(mm) DIMENSION	公差(mm) TOLERANCE
0 ＜ L ≦ 50	±1.5
50 ＜ L ≦ 100	±2.5
100 ＜ L ≦ 500	±3

DRAWN June 27 '00 T.YAMASAKI	TITLE PSU-004
CHECKED June 27 '00 Y.Kim	名称 電源制御部
APPROVED June 27 '00 Y.Kim	外寸図
SCALE 1/4 — MASS 2.3 kg ±10%	NAME POWER SUPPLY UNIT
DWG. No. C3385-G02- D	OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.



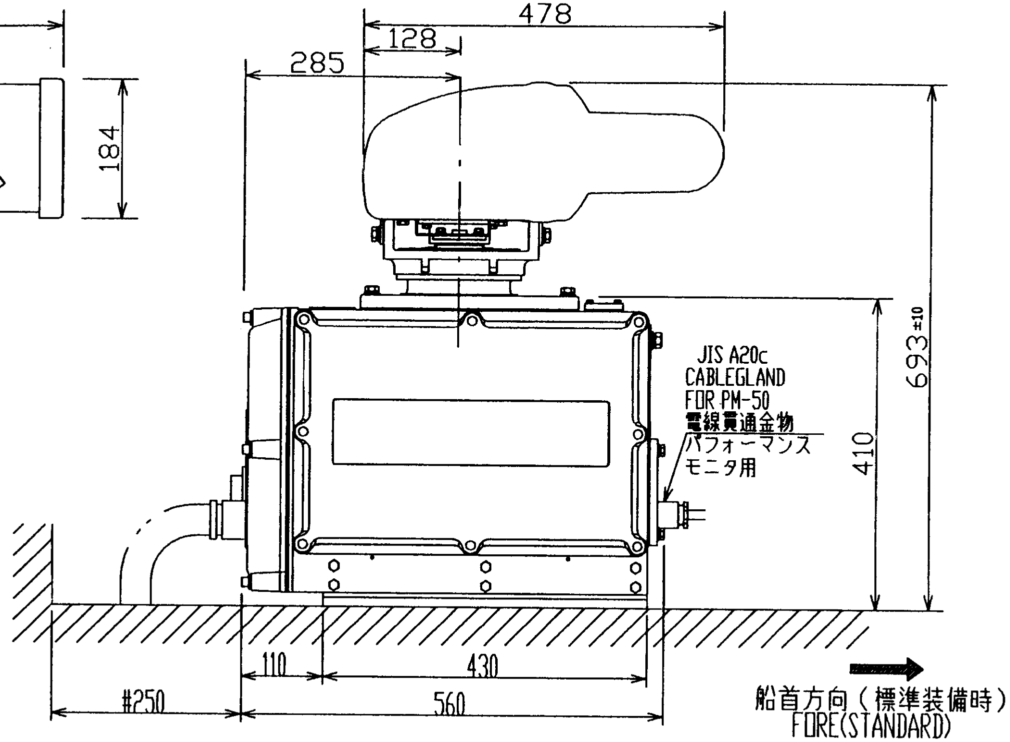


表２　TABLE 2

種　類※※ ANT TYPE	SN36AF	SN30AF
空中線長(A) ANT LENGTH (mm)	3765±10	3090±10
回転安全空間(B) ANT CLEARANCE (mm)	3860	3200
質　量 MASS (kg)	133±10%	127±10%

※※レーダー型式により異なる。各仕様参照。
REFER TO SPECS. AS RADAR TYPE.

表１　TABLE 1

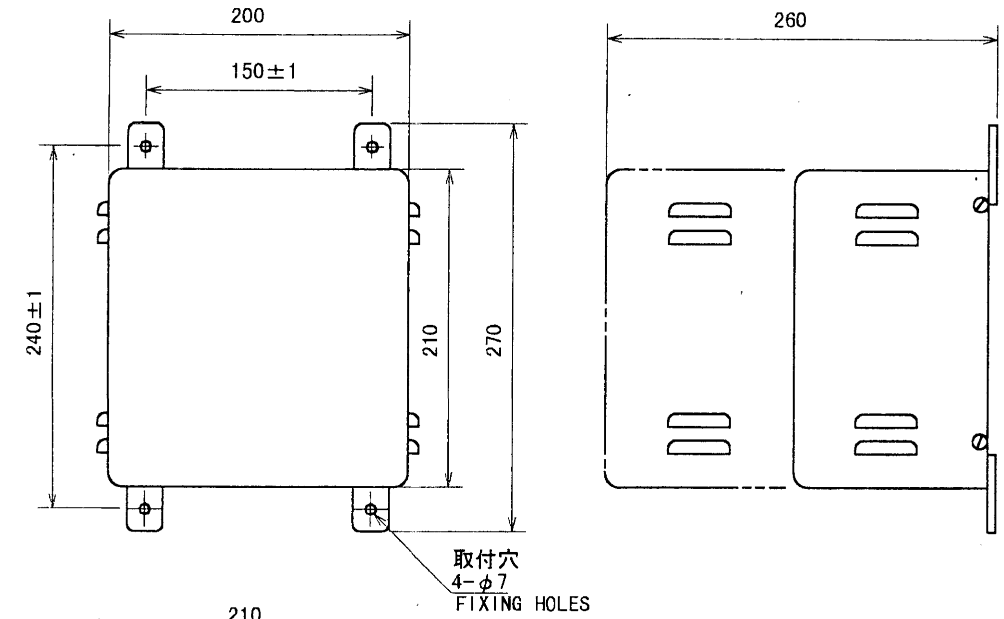
寸法区分（mm） DIMENSION	公差（mm） TOLERANCE
0 ＜ L ≦ 50	±1.5
50 ＜ L ≦ 100	±2.5
100 ＜ L ≦ 500	±3
500 ＜ L ≦ 1000	±4
1000 ＜ L ≦ 2000	±5
2000 ＜ L ≦ 4000	±7

注　記
1）＃印寸法は最小サービス空間寸法とする。
2）取付用ネジはM１２ボルトを使用のこと。
3）指定外の寸法公差は、表１による。

NOTE
1. #: RECOMMENDED SERVICE CLEARANCE.
2. USE M12 BOLTS FOR FIXING THE UNIT.
3. TABLE 1 INDICATES TOL. OF DIMENSIONS.

DRAWN Dec. 13 '01	T.YAMASAKI	TITLE	RSB-0026/0088/0089/0090/0031-066
CHECKED Dec 13 '01	Y.Kim	名称	空中線部
APPROVED Dec 13 '01	Y.Kim	FR/FAR-2835S FR-2135S	外寸図
SCALE 1/10	MASS 表2参照 SEE TABLE 2	NAME	SCANNER UNIT
DWG.No.	C3469-G01-C	03-145-400G-2	OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.



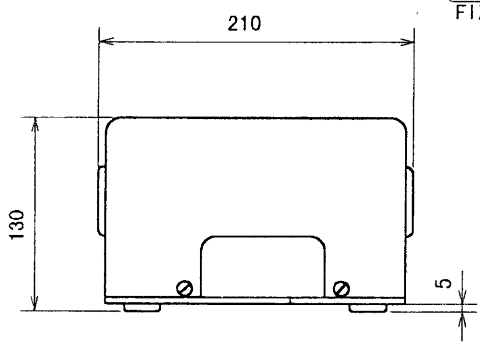
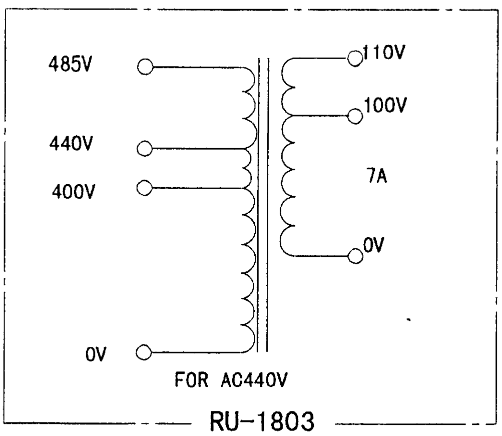
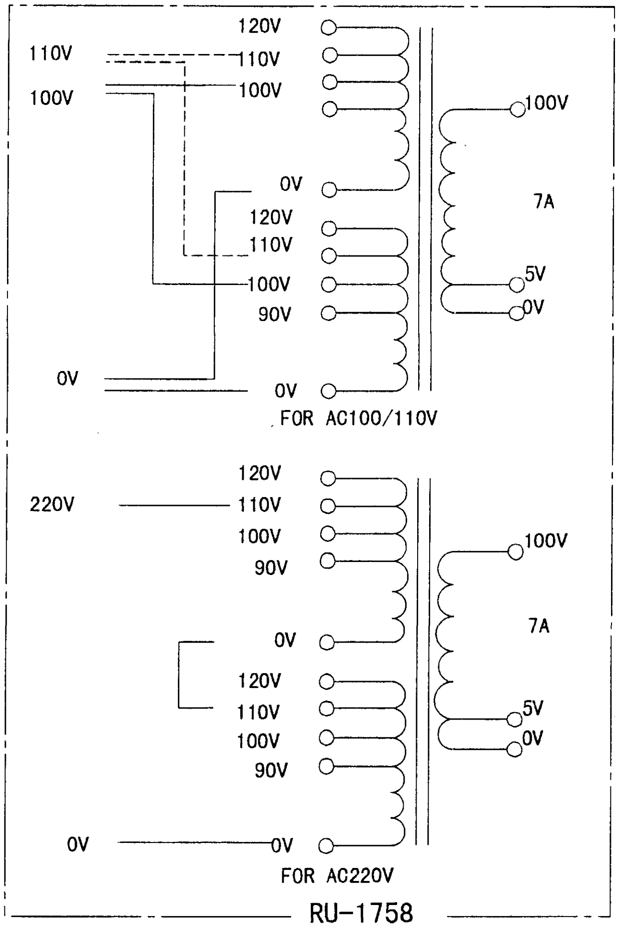


表１　TABLE 1

寸法区分(mm) DIMENSION	公差(mm) TOLERANCE
0 ＜ L ≦ 50	±1.5
50 ＜ L ≦ 100	±2.5
100 ＜ L ≦ 500	±3



RU-1803

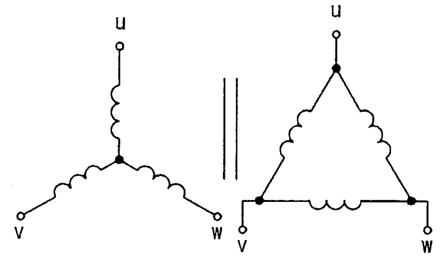


RU-1758

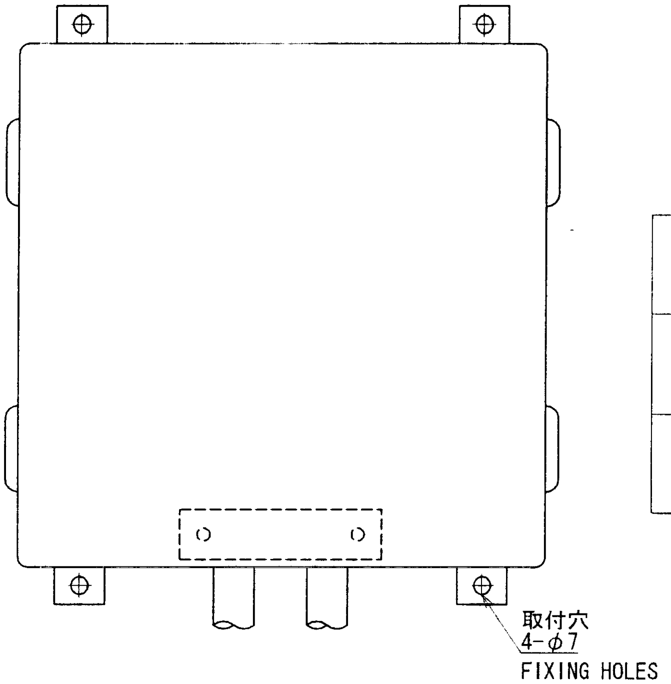
注記
1）指定なき寸法公差は表１による。

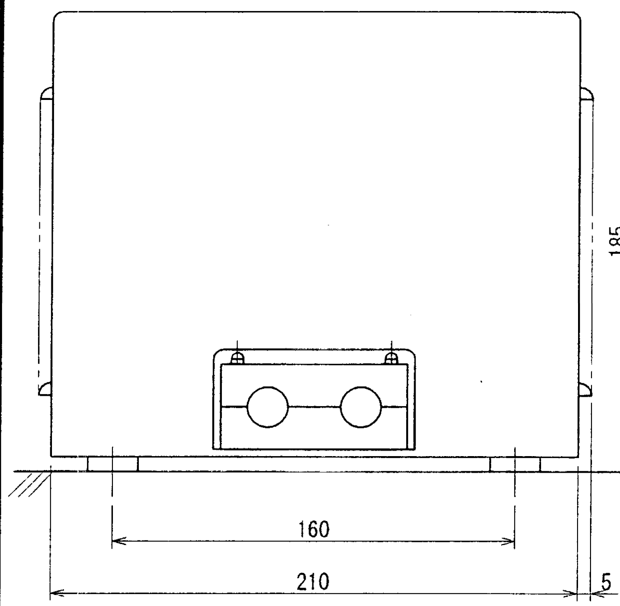
NOTE
1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS.

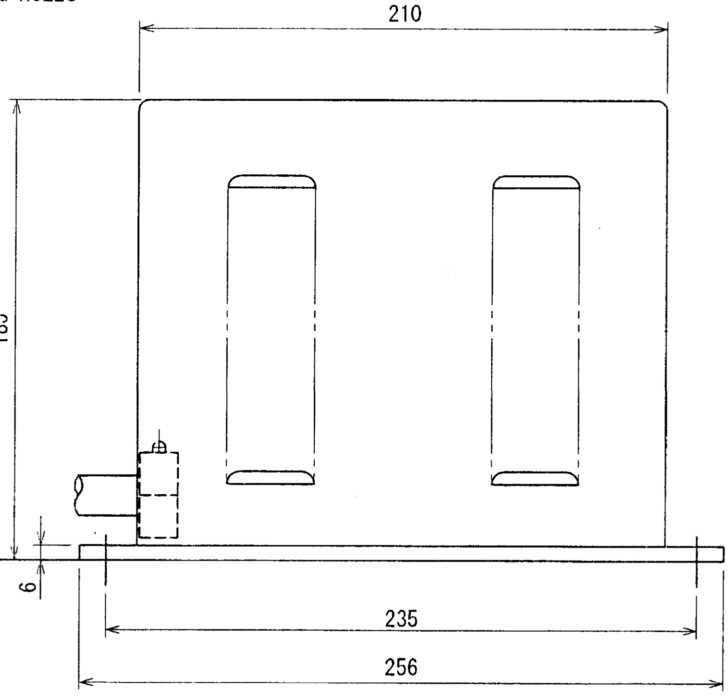
DRAWN: June 28 '00 T. YAMASAKI	TITLE: RU-1758/1803
CHECKED: June 28 '00 Y. Kim	名称: トランスユニット 外寸図
APPROVED: June 28 '00 Y. Kim	
SCALE: 1/5 ; MASS ±10%: 12 kg	NAME: TRANSFORMER UNIT OUTLINE DRAWING
DWG. No.: C3003-001- E	



RU-5466-1	AC440V 3φ 50/60Hz	AC220V 3φ 60Hz	AC200V 3φ 50Hz
RU-6764	AC380V 3φ 50Hz	AC200V 3φ 50Hz	
RU-5693	AC110V 3φ 60Hz	AC220V 3φ 60Hz	



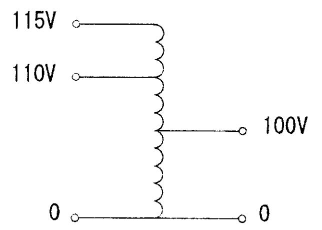




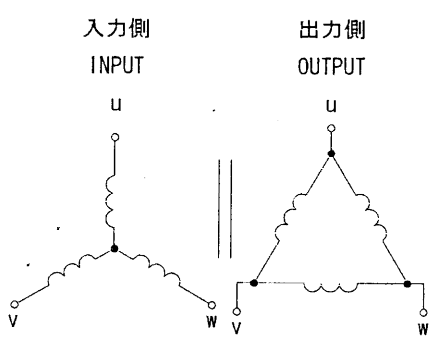
DRAWN Aug 16 '00 T. YAMASAKI		TITLE	RU-5466-1, RU-6764/5693
CHECKED Aug 17 '00		名称	トランスユニット
APPROVED Aug 17 '00			外寸図
SCALE 1/3	MASS 12 kg ±10%	NAME	TRANSFORMER UNIT
DWG. No. C3003-006- F			OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.

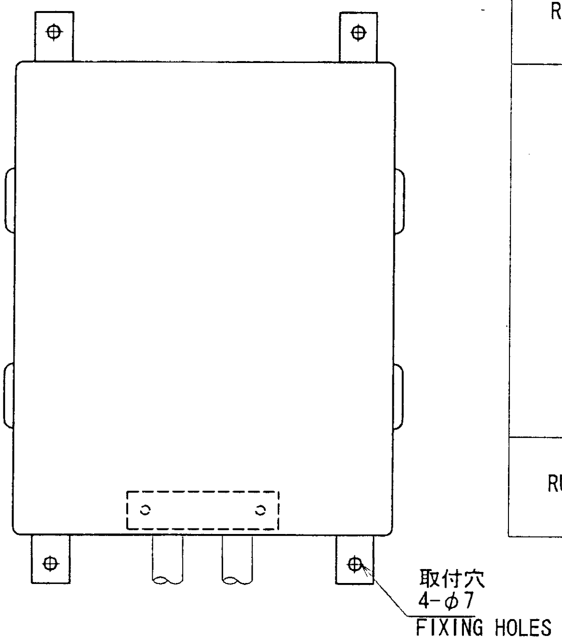
FURUNO

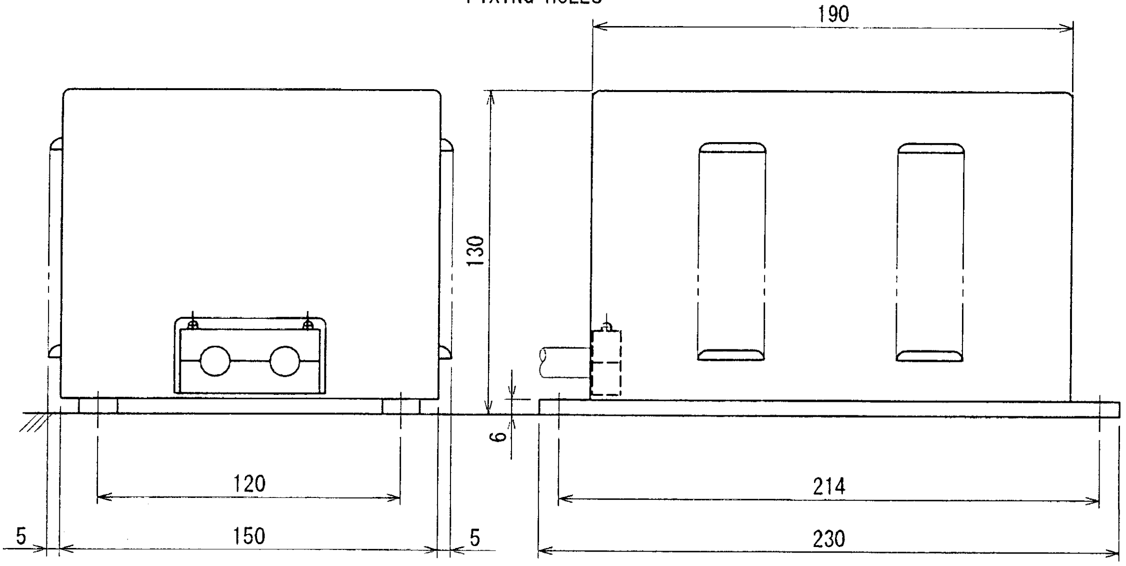


RU-6347	AC110/115V 1ϕ 50/60Hz	AC100V 1ϕ 50/60Hz



RU-6522	AC220V 3ϕ 50Hz	AC200V 3ϕ 50Hz



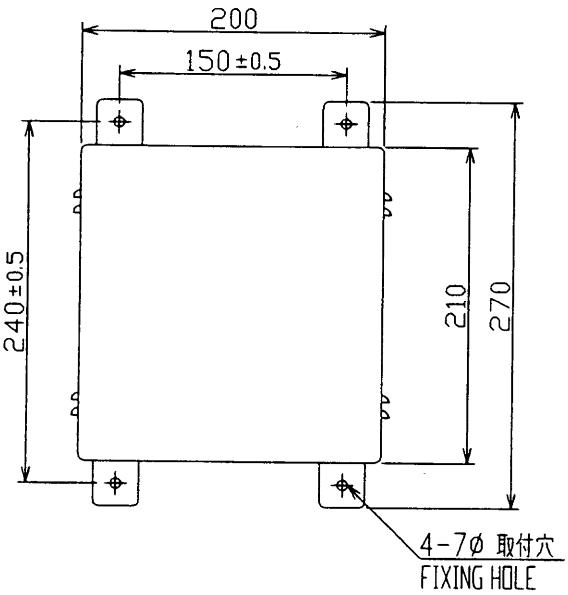


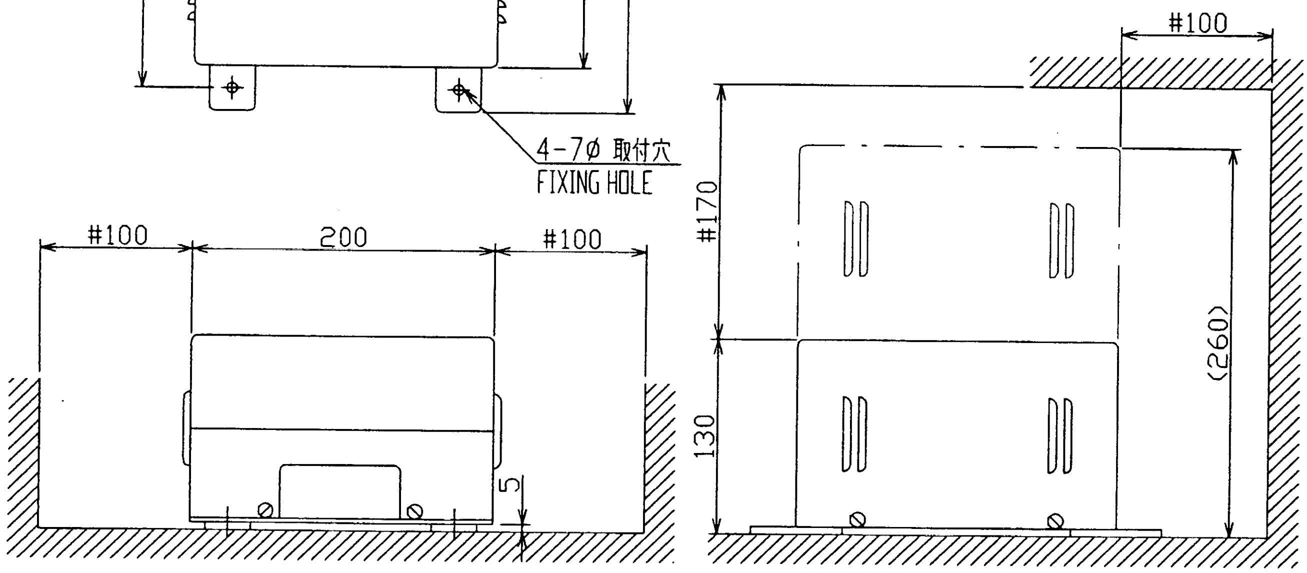
DRAWN Aug 16 '02 T.YAMASAKI		TITLE	RU-6347/6522
CHECKED Aug 17 '02 Y.Kimi		名称	トランスユニット
APPROVED Aug 17 '02 Y.Kimi			外寸図
SCALE 1/3	MASS 12 kg ±10%	NAME	TRANSFORMER UNIT
DWG. No. C3003-007- C			OUTLINE DRAWING

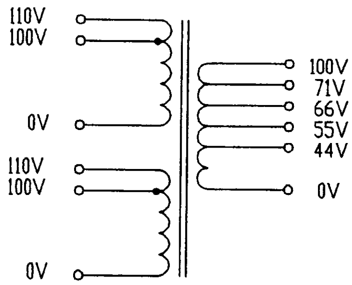
FURUNO ELECTRIC CO., LTD.

寸法区分（mm） DIMENSION	公差（mm） TOLERANCE
L≦50	±1.5
50＜L≦100	±2.5
100＜L≦500	±3

表1 TABLE 1







注 記
1）指定なき寸法公差は表1による。
2）#：推奨する最小サービス空間寸法。

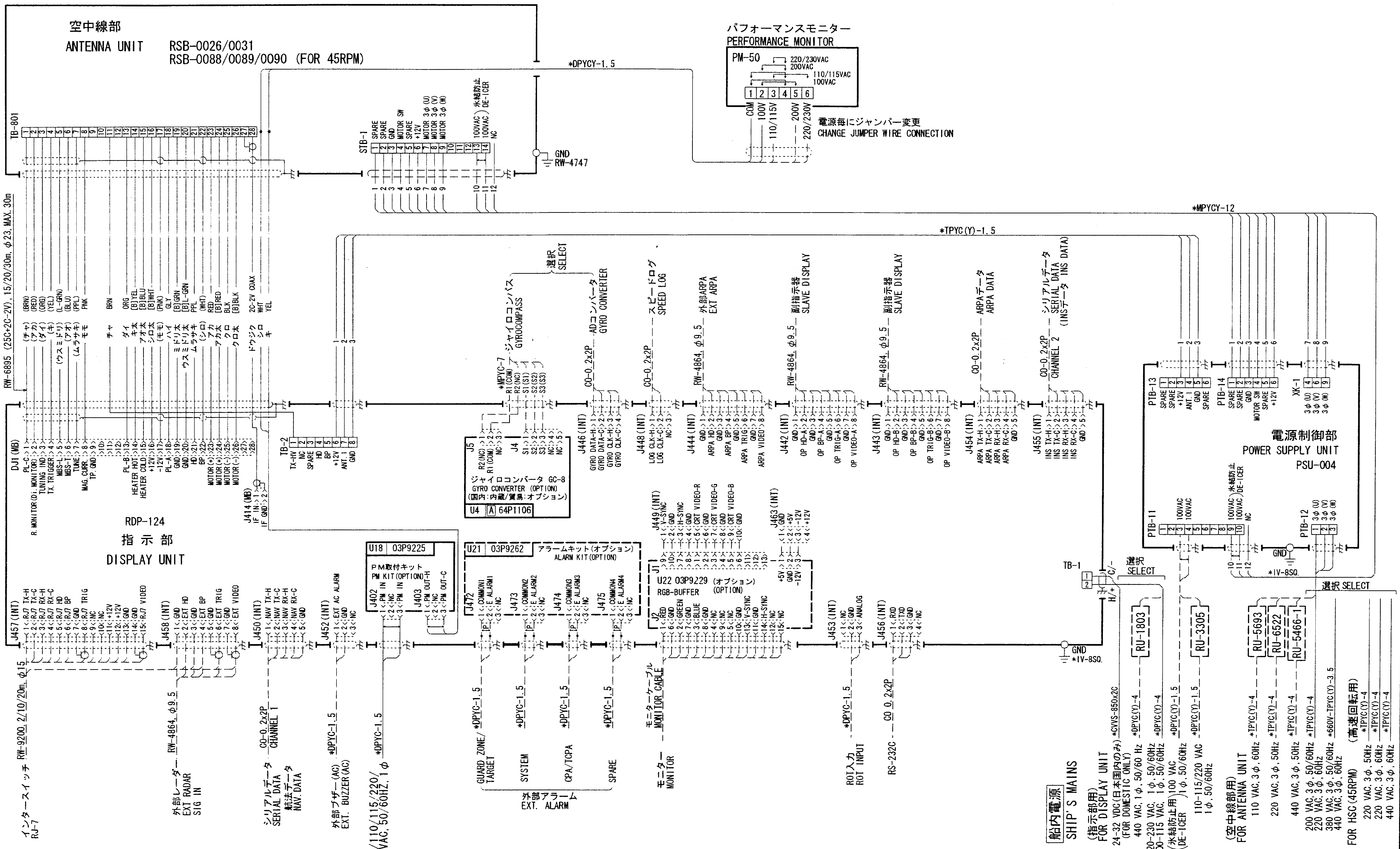
NOTE
1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS.
2. #: RECOMMENDED SERVICE CLEARANCE.

コンパス安全距離 COMPASS SAFE DISTANCE

スタンダード STANDARD	2.1 m
ステアリング STEERING	1.5 m

DRAWN	Aug. 9 '02 T.YAMASAKI
CHECKED	Aug.9 '02 Y.K.
APPROVED	Aug. 9 '02 Y.K.
SCALE	1/5
MASS	12.2 kg ±10%
DWG.No.	C3003-004-E
TITLE	RU-3305
名称	トランスユニット 外寸図
NAME	TRANSFORMER UNIT OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.



注 記
1) *:造船所手配
2) () 内のカラーコードは内側シールド内の線を示す。

NOTE
1. *:SHIPYARD SUPPLY
2. WIRE COLOR CODE ( ): INSIDE WIRES. [B]: BIG WIRES, L-: LIGHT COLOR.

CO-0.2x2P: CO-SPEVV-SB-C 0.2x2P, φ10.5
CO-0.2x5P: CO-SPEVV-SB-C 0.2x5P, φ13.5
CO-0.2x10P: CO-SPEVV-SB-C 0.2x10P, φ16.5

DRAWN	Sep 14 '00 T.YAMASAKI	TYPE	FR-2135S
CHECKED	Sep 14 '00 T.K	名 称	船舶用レーダー
APPROVED	Sep 14 '00 T.K		相互結線図
SCALE	MASS kg	NAME	MARINE RADAR
DWG. No.	C3469-C02- G 03-144-6004-2		INTERCONNECTION DIAGRAM

FURUNO ELECTRIC CO., LTD.